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ECOLOGICAL DETERMINANTS OF RISKY SEXUAL BEHAVIOURS AMONG ADOLESCENTS AND YOUNG ADULTS IN CAPE TOWN, SOUTH AFRICA: A CUMULATIVE RISK FACTOR APPROACH

By

Evans Mwiti MUCHIRI

Student Number: 741906



A thesis submitted to the Faculty of Humanities and Social Sciences, University of the Witwatersrand, Johannesburg, in fulfilment of the requirements for the degree of Doctor of Philosophy (PhD.) in Demography and Population Studies.

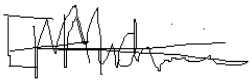
Johannesburg, 2018

Declaration

I, Evans Mwiti MUCHIRI, declare that this thesis is my own unaided work. It is being submitted for the degree of Doctor of Philosophy (PhD.) in Demography and Population Studies, Schools of Social Sciences and Public Health, Faculty of Humanities of University of the Witwatersrand, Johannesburg, South Africa. To the best of my knowledge, this work has not been submitted before in part or in full for any degree or examination at this or any other University.

Student Name: Evans Mwiti MUCHIRI

Student Number: 741906

Signature: 

Signed and dated on the **15** day of **February**, **2018**

Dedication

Dedicated to my parents, siblings, and my family; you taught me to read and write, and supported me through my every aspiration.

Acknowledgement

I sincerely thank Prof. Clifford Odimegwu, of Demography and Population Studies (DPS) Programme for welcoming me and providing guidance to the conception of this study. Without your support and encouragement, this endeavour would never have been possible. The staff at DPS, Dr. Nicole De Wet and Dr. Joshua Akinyemi for supporting review and critique of this work, and my colleagues at DPS for shaping this research through their invaluable input. I also thank the University of the Witwatersrand for tuition support including the postgraduate merit award (PMA). More gratitude goes to staff at the Faculty of Humanities including Prof. Eric Worby, Sarah Mfupa, Julia Mamabolo and Veli Mlongwane for provision of study support, the Humanities Graduate Centre (HGC) for study Carrels and grant for study completion.

My sincere gratitude goes to The Cape Area Panel Study (CAPS) team for publicly availing study datasets. The Cape Area Panel Study Waves 1-2-3 were collected between 2002 and 2005 by the University of Cape Town and the University of Michigan, with funding provided by the US National Institute for Child Health and Human Development (NICHD) and the Andrew W. Mellon Foundation. Wave 4 was collected in 2006 by the University of Cape Town, the University of Michigan, and Princeton University. Major funding for Wave 4 was provided by the National Institute on Aging through a grant to Princeton University, in addition to funding provided by NICHD through the University of Michigan. Wave 5 was collected in 2009 by the Centre for Social Science Research (CSSR) at the University of Cape Town. Major funding for Wave 5 was provided by the Health Economics & HIV/AIDS Research Division at the University of KwaZulu-Natal, with additional funding from the Andrew W. Mellon Foundation, the European Union (through the Microcon research partnership on the micro-foundations of violent conduct, via the CSSR) and the NICHD (through the University of Michigan).

My heartfelt gratitude goes to my family, parents, siblings, and friends for their wonderful support throughout this work. This accomplishment would never have been possible without the patience, love and support of my beloved family: my wife Zeddy and my daughters Ava and Chloe. It is impossible to make up for time spent away, and sacrifices you made. My beloved parents, late dad Muchiri wa Kaungu, and mother Janet Muchiri for your upbringing and unwavering support. I now understand the importance of hard work, honesty, and dedication. To my truly wonderful and beautiful sisters Maureen, Lillian, Florence and your families for supporting me in my decisions, and standing with me, yours is indeed true love. To my brothers Michael, Douglas, Gideon, and your families, this is truly for you, for serving as role models. To the entire Kaungu's family, I appreciate greatly every support you have extended to me in form of encouragement, moral and material support during my upbringing and academic pursuit. Mine is to say thank you for everything you have done and my prayer is that the Almighty God bless you all abundantly. And to my many friends made before and during this endeavour, am forever grateful for the love, consideration, and kindness you showed to me.

More importantly, I praise the Almighty God for good health, patience, protection, and provision during this endeavour, it was not easy but it was worth it.

Johannesburg, 15 February, 2018

Evans Mwiti MUCHIRI

Biosketch

Mr. Evans Muchiri

Mr. Evans Muchiri graduated with an MSc in Medical Statistics from the London School of Hygiene & Tropical Medicine (LSHTM), UK in 2009. He holds a BSc in Statistics from the University of Nairobi, and possesses a diploma in Information Technology from the Institute of Technology Studies and Research (ITSR), in Kenya. Mr. Muchiri has experience in design, analysis, and evaluation of demographic, health, social and development projects. He has worked in population health in areas of demography, applied statistics, and epidemiology with various organizations based in Kenya, South Africa, United Kingdom, and the United States of America.

Mr. Muchiri has published articles as a first author and in collaboration with colleagues in peer reviewed local and international journals. He has made oral presentations at international conferences including Population Association of America (PAA), Union of African Population Studies (UAPS 2015) in Johannesburg, South Africa, and Making Impact Evaluation Matter (Evidence Matters – 2014). He has previously won competitive grants including travel to the PAA 2015 in San Diego CA, USA and the Evidence Matters 2014 in Manila, Philippines. Mr. Muchiri attended the Policy Communication Fellowship workshop at the Population Reference Bureau (PRB), Washington D.C., which trains upcoming researchers on bridging the gap between research and policy. He has also previously received the Tropical Epidemiology Group (TEG) award for an African scientist to study MSc Medical Statistics at LSHTM. Mr Muchiri has interests in interventions for improving population health with focus on HIV programmes, adolescents and young adults' health, and evaluation of development projects.

Personal Self-Assessment

Capacity-building workshops attended:

- Policy Communication Fellowship, Population Reference Bureau, Washington DC, USA
- Multi-level modelling workshop by Dr. Sunday Adedini, DPS Lab, University of the Witwatersrand
- A 4 steps Own-Children Method: Prof Michael Garenne, DPS Lab, University of the Witwatersrand
- DPS PopStudies Mini-Conference, Demographic and Population Studies, University of the Witwatersrand, 2015 & 2017

Conferences attended making Oral or Poster Presentations

- Population Association of America, San Diego ,USA - Contextual Determinants of Sexual Risky Behaviours among Adolescents in urban Cape Town, South Africa: Findings from a Longitudinal Study using a Cumulative Risk Factor Approach , **2015**
- Union for African Population Studies, Johannesburg, South Africa – Application of a Cumulative Risk factor Approach to Study Adolescent Sexual Activity in Urban Cape Town, **2015**
- International Union of the Scientific Study of Populations, Cape Town, South Africa – A Cumulative Risk Approach to Study Sexual Activity Among adolescents and Young Adults in South Africa **2017**
- Population Association of Southern Africa– Applying a Cumulative Risk Factor Approach to Study Adolescent Sexual Activity in South Africa , **2016**
- 6th Cross- faculty Symposium, University of the Witwatersrand, Johannesburg, South Africa - A cumulative Risk Model To Study adolescents' Sexual Risky Behaviours: Early Sex Debut in the Cape Area, South Africa, **2015**
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Manuscripts under review

- Application of a Cumulative Risk Factor Approach to Study Adolescent Sexual activity in Urban Cape Town; Evans Muchiri, Clifford Odimegwu, Sunday Adedini ; JIADS
- Trends and gender differences in age at sex debut among adolescents and young adults in urban Cape Area, South Africa; Evans Muchiri, Clifford Odimegwu: AHS

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Contribution to the Department of DPS, University of the Witwatersrand

- Marking Honours students research dissertation supervised by Dr. Sunday Adedini
- Reviewing articles submitted for publications on the topics of HIV/AIDS and Sexual Reproductive Health

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Abstract

Context

South Africa is experiencing a youth bulge, and many demographers share the view that the country would experience a demographic dividend, by having a larger working population relative to the dependent population. A 'demographic dividend' is characterised by an accelerated economic growth that occurs when there is a growing proportion of productive people in the workforce compared to the dependent population. For a demographic dividend to occur, change in age structure takes place, and a significant decline in fertility is observed. Decrease in fertility and improving health can lead to a shift in age structure of a population, decreasing the ratio of dependent population. In the case of South Africa, with a total population estimated at 55 million in 2015, people aged between 15 and 35 years constituted 36% of the population, according to Statistics South Africa (StatsSA, 2015). However, low life expectancy occasioned by HIV and AIDS, and lost schooling time due to teenage pregnancies impacting on future productivity and earnings, makes it not obvious for South Africa to experience a demographic dividend. Besides, increasing mortality from AIDS related illnesses, and the impact of unwanted pregnancy on fertility, may have a strong bearing on outcomes relevant to demography and population studies.

Despite South African youth constituting less than 1% of the global youth (15-24 years) population, the country accounts for up to 15% of HIV youth population globally living with HIV according to the UNAIDS (UNAIDS, 2016). Increased mortality among adolescents and young adults living with HIV due to AIDS related illnesses reduces life expectancy that has important implications on demographic aspects of the population. Despite AIDS-related deaths among adults (15+ years) having been declining since the rollout of antiretroviral treatment

(ART) in 2004, recent statistics from UNAIDS indicate that AIDS-related deaths among adolescents may actually be increasing due to low uptake of ART treatment (UNAIDS, 2014).

While HIV is one of the unintended consequences of unprotected sex, unwanted pregnancy is another indicator of unprotected sexual activity. More than 30% of teenage girls in South Africa report experiencing pregnancy whose majority are unplanned (Jewkes, Morrell, & Christofides, 2009). In absolute numbers, more than 99,000 school attending teenagers fell pregnant in 2013, a rise since 2011 when 66,000 school attending teenage pregnancies were reported(StatsSA, 2013a). Maternal mortality and health implications related to childbearing is higher among teenage mothers compared to general population, because their reproductive systems have not fully developed, and struggle to deliver naturally. In South Africa, an estimated 36% of all maternal deaths occurred to teenage mothers even though they only accounted for 8% of all new births. Childbirth at a young age leads to health complications that may result in mortality and increases the risk of developing obstetric fistulae. Acquiring HIV infections and unintended underage pregnancy have significant contribution to morbidity, mortality and fertility, aspects that are relevant for demography and population studies field.

Globally, shift towards late marriage in many countries has led to an increase in premarital sexual activity (Blum, 2007). It has been reported that adolescents and young adults become sexually active in their teen years and rarely takes precaution to practice safe sex. Research has established a clear association between risky sexual behaviours of unprotected sex, early age at sex debut, and multiple and concurrent partnerships to increased risk of HIV infection and unwanted pregnancy (Ghebremichael, Larsen, & Paintsil, 2009; Pettifor, O'Brien, Macphail, Miller, & Rees, 2009; Pettifor, van der Straten, Dunbar, Shiboski, & Padian, 2004). Risky sexual behaviours are defined by the increased risk of a negative outcome of contracting or transmitting

disease or the occurrence of unwanted pregnancy. Research studies in South Africa have reported high levels of unsafe sexual practices among adolescents and young adults (Pettifor et al., 2009).

Previous studies have reported on correlates of risky sexual behaviours among adolescents and young adults, however, these studies mainly analysed individual level attributes using cross-sectional datasets (McHunu, Peltzer, Tutshana, & Seutlwadi, 2012; Onoya, Zuma, Zungu, Shisana, & Mehlomakhulu, 2015; Shisana et al., 2014; Zuma, Mzolo, & Makonko, 2011). Besides, studies of risky sexual behaviours among adolescents and young adults have mainly investigated the effect of risk factors studied in isolation. This study aims to add to existing literature by seeking to understand whether risk factors occurring at the individual, household, and community levels may have a cumulative effect.

Furthermore, analyses of risky sexual behaviours have mainly used cross-sectional datasets because of the complex nature of collecting longitudinal dataset for sexual behaviours. Cross-sectional analyses may inform on associations but are limited to making causal inferences and lack information on trends over time. Therefore, this study incorporated all factors at the individual, household, and community levels to investigate for significant determinants of risky sexual behaviours. Further, this study used a longitudinal approach to investigate on trends and determinants of risky sexual behaviours among adolescents and young adults, and assessed whether significant risk factors for risky sexual behaviours may have a cumulative effect is a timely contribution to literature. The cumulative risk model adopted in this research assumes that the effect of ecological risk factors act in a cumulative way; arguing that increasing risk factors present in the ecology of adolescents and young adults may correlate to an increasing likelihood of reporting outcomes of risk sexual behaviours.

Research on the cumulative risk model has only been reported in the United States of America and England which represent contexts of developed countries and has not been assessed before in Sub-Saharan Africa (Small & Luster, 1994). Therefore, results from testing the model in high HIV settings may add contribution to existing literature and may inform research in South Africa and sub-Saharan Africa. Understanding why adolescents and young adults in urban Cape Area, South Africa engage in risky sexual behaviours, and whether significant risk factors act cumulatively, would contribute immensely to the study of demography and population studies for both South Africa and the African continent. Findings from this thesis would inform on the design and implementation of effective interventions that may reduce the occurrence of risky sexual behaviours.

Data Sources and Methods

Data from the Cape Area Panel Study (CAPS) that enrolled 4,752 adolescents aged between 14 and 22 years in urban Cape Town, South Africa, were used to investigate trends and ecological determinants of risky sexual behaviours. The CAPS data were collected in waves of surveys with the baseline survey conducted in 2002 while the last recorded survey was in 2009. The CAPS sampling plan was to produce a household sample that was representative of households in urban Cape Town A young adult respondent was identified from a selected household and interviewed, and was similarly followed-up in subsequent survey waves, for updated responses. The surveys focused on a wide range of issues affecting the adolescents and young adults participating in the various waves of the surveys. These included school, work, household living arrangements, sexual behaviours and reproductive health. Further, the young adult sample was designed to produce a representative sample of the population aged 14 to 22 years in urban Cape Town. The Wave 1 survey was conducted in 2002, and subsequent surveys for Wave 2a/2b conducted in

2003/2004, Wave 3 in 2005, Wave 4 in 2006, and Wave 5 in 2009. A longitudinal analysis dataset was defined for outcomes of early age at sex debut, multiple sexual partnerships, and inconsistency in condom use. Baseline characteristics were defined from the baseline survey and were used to inform on factors that were significantly different for the binary outcomes during the follow-up period until survey Wave 5. Dependent variables were created as binary responses experienced during the follow-up, for early sexual debut, reporting multiple sexual partnerships, and consistency in the use of condoms where all analyses were conducted stratified by gender. An adapted ecological systems framework was used to organise risk factors according to levels of the ecology including factors at individual, household, and community levels.

Descriptive statistics were performed for baseline characteristics of the sample using frequencies and proportions. Bivariate analyses for the binary outcomes of risky sexual behaviours were performed, with differences between outcome groups assessed using Chi-square tests. The level of significance for all statistical tests, and univariate and multivariate models was set at $p<0.05$. A univariate and multivariate discriminant function analyses (DFA) was applied to identify risk factors that were significantly different between the binary outcome groups. The DFA expresses a dependent variable as a linear combination of independent variables that best explains differences between outcome groups. The DFA technique was used to predict a categorical dependent variable from continuous or binary responses and assumes the normality of the explanatory variables.

The study further applied a cumulative risk analysis where significant ecological risk factors identified in the multivariate models were hypothesised to have a cumulative effect on risky sexual behaviours. Risk indices were created for factors that were significant in multivariate analyses to represent presence or absence of risk. The generated indices were summed to

represent a cumulative risk and a correlation between the cumulative risk and the outcomes of risky sexual behaviours were investigated. Simple linear regression analyses were conducted to study the relationship between cumulative risk index and proportion of adolescents and young adults reporting the risky sexual behaviour outcome.

Results

A total of 4,752 respondents were interviewed, with 45.0% of the respondents being males, with a sample mean age of 18 (SD 2.5) years and a range of between 14 years and 22 years at baseline. The majority of respondents were unmarried with 98.9% reporting to have never been married during while only 28.3% reported working in the last year. At Wave 1 (2002), only 46% of respondents were sexually experienced compared to 94.3% at the end of Wave 5 (2009) survey showing a steady increase over the period. The mean age at sexual debut at Wave 1 was reported to be 16.2 (SD 1.8) years and increased to 19.4 (2.8) years at Wave 5 progressively increasing during the period. At Wave 1 71.5% used protection against disease or pregnancy, compared to 65.1% at Wave 5 showing a decline in condom use during the period. Number of reported sexual partners in the last 12 months was steady at a median of 1 for both Wave 1 and Wave 5.

Determinants for early age at sexual debut included years of education and age of first sex partner for both males and females at the individual level. While at the household level, only spending time with a mother was significant for females. Most community level factors were significant for both males and females including proportion unemployed, proportion individual Africans, and proportion below poverty line. Furthermore, additional determinants of risky sexual behaviours never reported before were identified, with more emphasis on the importance

role of community level socio-economic status including mean years of education and employment status of household heads. Significant differences in sexual behaviours were observed at individual level characteristics of schooling status, planning to marry in the short term, living with a single or both parents, and community levels of education and employment. The study found that ecological risk factors had a cumulative effect, meaning that as more risk factors became present, there was a corresponding increase in reports of risky sexual behaviours for the three outcomes investigated.

Conclusions

This study finds that the prevalence of risky sexual behaviour among young adults in urban Cape Town to be high, even though observed levels were not particularly different from levels observed in developed countries. However, in the context of a high HIV incidence of South Africa, these are important issues that need to be addressed. The important role that community socio-economic status plays was evident with a many of community factors returning significant for risky sexual behaviour studied. Findings from this study demonstrate that risk factors for sexual behaviour appear at all levels of the ecology that include characteristics at the individual, household and community levels. Further it was demonstrated that as factors becomes more prevalent in the context of the adolescents and young adults respondents, they reported increasingly engaging in risky sexual behaviours indicating that ecological risk factors had a cumulatively.

Interventions for risky sexual behaviour should be designed to include factors at all levels of the ecology as their effect tends to be cumulative. Socio-economic incentives that provide cash handouts to adolescents and young adults should be encouraged that intervenes to keep

adolescents away from risky sexual activity. These programmes have worked in KwaZulu-Natal province, South Africa and have potential to work in urban Cape Town. Cash incentives have been effective in preventing pregnancy and marriage among adolescent girls in Kenya and India (Handa et al., 2015). Monthly stipends on school-attending condition would not only provide adolescents and young adults with schooling opportunities but also provide required economic incentives to stay away from transactional sex.

These findings are important for public health and population studies in South Africa because understanding risky sexual behaviours may inform on the design of effective programmes for mitigating the negative health outcomes associated. Since findings indicate that as ecological risk factors accumulate, risky sexual behaviours increase, this is important for policy and programme design. Programmes for reducing early sex initiation, unprotected sexual activity, and multiple partnerships among adolescents and young adults impact on fertility, mortality, and informs whether the country would achieve a demographic dividend. The flexibility of the ecological systems model was demonstrated in these analyses where it was adapted into the unique and specific settings of sub-Saharan Africa and in the case of Cape Town, an urban settings with differing socio-economic status communities. Therefore, the ecological systems framework was a powerful and a practical tool to study sexual behaviours in South Africa. Research on the effectiveness of programmes that compensate for the cumulative risk that is occasioned in communities with low socio-economic status is urgently required.

Keywords: Adolescents, young adults, risky sexual behaviours, HIV and AIDS, teenage pregnancy, cumulative risk, ecological systems, multiple partnerships, sex debut, and condom use.

CHAPTER 1: INTRODUCTION

1.0 Introduction to the Study

Globally, it is acknowledged that adolescents and young adults constitute an important population of any country, upon which future economic prospects lie (Lancet, 2012). The UNFPA reports that the world is home to an estimated 1.8 billion young people aged between 10 and 24 years (UNFPA, 2014). According to the Population Reference Bureau (PRB), the population in sub-Saharan African countries is young, with more than half of the population aged younger than 25 years. The health of adolescents and young adults in many countries often demonstrates the extent to which a country would achieve its development goals.

South Africa is currently experiencing a youth bulge with an estimated 39% of the population aged between 14 and 35 year, according to Statistics South Africa (StatsSA, 2013b). A youth bulge is a population phenomenon that occurs mainly in developing countries, often due to a country achieving success in reducing infant mortality even though women have a high total fertility. Demographers and economists argue that a country would benefit from a demographic dividend by having a larger working population relative to the dependent population (AU, 2013; Eastwood & Lipton, 2011). A demographic dividend is the economic growth that may result from a changing age structure. Change in age structure is driven by a transition from people living shorter lives and having large families to people living longer and having small families. Reducing long term fertility is the most important aspect for accelerating a demographic dividend, accompanied by improved health for the young population. A large working population relative to less dependent population saves money on health care and increases on investments that provides better opportunities for children to grow into healthy and productive

adults. A requirement is for countries to have strong public health systems that promote child survival, improved access and uptake of family planning, improvement in quality of education, and a stable environment conducive for growth and job creation for young adults to be economically productive. According to The World Bank, one measure of turning a youth bulge into a demographic dividend is providing sustainable employment opportunities (TheWorldBank, 2011). Globally, youth employment rates are lower than adult rates, because of fewer years of training and work experience.

South Africa may not achieve a demographic dividend because of increased morbidity and mortality resulting from the HIV / AIDS epidemic that has dramatically reduced life expectancy and weakened healthcare systems for the past three decades (StatsSA, 2013b). Furthermore, a high occurrence of underage pregnancy among school attending girls disrupts education opportunities, reducing future employment prospects and earning potential (Taylor et al., 2014). It is important to have an elaborate plan to invest in the health and well-being of adolescents and young adults in South Africa for them to positively transition into adulthood. For South Africa to realise a demographic dividend, it is important to understand the challenges of sexual and reproductive health of adolescents and young adults, to design effective interventions that account for the potential effect of cumulative risk emanating from contextual factors.

The World Health Organisation (WHO) defines an adolescent as any person aged between 10 and 19 years while a young adult is a person aged between 15 and 24 years. Both adolescence and young adulthood stages represent delicate transition stages in life between childhood and adulthood that may result in a successful transition or negative development into adulthood. This is a period when puberty takes place, people initiate first sexual relationships, sexual risk taking begins, and influence from peers is important (UNESCO, 2012). Adolescence is often

challenging as young people mainly rely on their peers and families as they transition into adulthood (Furstenberg, 2015). Transition from childhood into adulthood requires an adolescent or a young adult to make life adjustments, develop new skills, and learn to cope with new experiences. A successful transition into adulthood forms a strong foundation for future stages of development (Lenz, 2001). It is during these transition years that adolescents and young adults make decisions on schooling, leaving home, starting a job, forming partnerships, and having children (Furstenberg, 2010, 2015). Adolescents and young adults experience pressure to initiate sexual relationships thus putting themselves at risk of unintended pregnancies and sexually transmitted infections (STIs) including HIV and AIDS. Unintended pregnancy results from unprotected sex without utilisation of an effective family planning method.

Globally, teenage pregnancy has largely been attributed to peer influence to engage in sexual activity that is largely unprotected, where teenage girls lack knowledge on protection and contraceptive use (KFF, 2012). Estimates reported by the Kaiser Foundation, indicate that about 30% of pregnant teenagers in the US reported feeling pressured into having sex as a way of fitting in, while 33% admitting not being ready for sex but continued with it anyway (KFF, 2012). A small proportion of teenage pregnancy occurs through sexual abuse or rape by an older male. Drug abuse has also been attributed to teenage pregnancy where teens experiment with alcohol and drugs, while engaging in sexual activity. In the USA, an estimated 229,715 babies were born to women aged 15 to 19 years in 2015, a substantial decrease compared to 2014 but remains one of the highest teenage pregnancy rates in developed countries (J. A. Martin, Hamilton, & Osterman, 2017). More than half (51%) in 2008 were unintended rate of 54 per 1000 women aged 15-44 years) with 91% of all pregnancies in 15-17 year olds being unintended (Finer & Zolna, 2014). Further, rates of unintended pregnancies are higher among substance

using women, especially opioid users, where among treatment-seeking pregnant women with opioid use disorders, 86% of pregnancies were reported to be unplanned (Connery, Albright, & Rodolico, 2014). Teenage pregnancy mainly affects school going learners and has the interrupt their education outcomes.

In South Africa, there is consensus that teenage pregnancy is a social phenomenon where teenage mothers have their attitudes and actions shaped by their context. Even though total fertility in South Africa is low, a high proportion of adolescents experience pregnancy before the age of 20 years (Panday, Makiwane, Ranchod, & Letsoalo, 2009). Studies in South Africa have described prevailing rates of teenage pregnancy as high (Jewkes et al., 2009). In 2008, more than 35% of South African adolescents were estimated to have ever been pregnant with more than 30% having given birth at least once before they reached age 20 years (Panday et al., 2009; Willan, 2013). The high levels of reported teenage pregnancy in South Africa pose an important public health concern to the government. The Department of Basic Education (DBE) identified learners in poorly resourced schools and schools in poor neighbourhoods to be at a higher risk of teenage pregnancy.

Teenage pregnancy is associated with the increased risk of adverse pregnancy outcomes for both mother and child including increased maternal deaths, early neonatal deaths, and birth complications (Conde-Agudelo, Belizan, & Lammers, 2005). Termination of teenage pregnancy has adverse effects on adolescents and young adults' wellbeing. Unsafe abortion has been linked to a number of physical and psychological problems, including suicide, drug abuse and other self-destructive behaviours. In developing counties, estimates indicate that pregnancy and delivery complications, including unsafe abortion are the second leading cause of deaths among women below 20 years. Reducing rates of teenage pregnancies is timely as an important agenda

for meeting most of the United Nations Sustainable Development Goals (SDGs) including no poverty, zero hunger, good health and wellbeing, quality education, gender equality, and decent work and economic growth (UN, 2016).

Risky sexual behaviours are of particular concern to South Africa because of the HIV epidemic. In a global context, South Africa has the highest number of people living with HIV of any country in the world (UNAIDS, 2011). Adolescents and young adults have an estimated higher rate of new HIV infection accounting for over half of all new infections every year in South Africa (Shisana, Rehle, Simbayi, Parker, & Zuma, 2009). Population estimates indicate that South Africa has less than 1% of the world's youth, even though the country accounts for 15% of all youths living with HIV globally (Rehle et al., 2010). HIV infection among adolescents results from both socio-behavioural and contextual factors, with studies reporting a strong relationship between contextual factors and HIV infections. In 2012, the Human Science Research Council (HSRC) reported HIV prevalence in South Africa to be 12.2%, with 6.4 million people estimated to be living with the HIV virus. HIV prevalence estimates differed by gender, race, and region. The region with the highest prevalence was KwaZulu-Natal at 16.9% and least prevalence observed for Western Cape at 5.0% (Shisana et al., 2014).. Early sexual activity, coupled with low rates of condom-use and multiple and concurrent sexual partnerships, significantly increases the risk of experiencing pregnancy and acquiring STIs including HIV infection. Risky sexual behaviours among adolescents increase the risk of HIV infection and other STIs (Pettifor et al., 2005).

The South African government has responded to the challenge of prevailing high HIV prevalence and unwanted pregnancy by implementing national and sub-national level interventions. Programs to scale-up HIV counselling, testing and services targeting the youth,

were implemented. Male and female condoms are widely available in public institutions at no cost, with flavoured condoms targeting adolescents and young adults in educational institutions, while rolling out the largest Female Condom program in Africa (Beksinska, Smit, & Mantell, 2012). Barriers for access to contraceptive have been removed and public knowledge on contraceptives has been improved. The Demographic and Health Survey (DHS) conducted 2003 in in South Africa found that about two-thirds of sexually active women aged 15-19 years were using modern contraceptives in 2003. Scaling-up of HIV and AIDS treatment program using antiretroviral therapy (ART) by the government in partnership with non-governmental organisations with South Africa boasting of the highest number of people on ART treatment of any country. As of 2014, more than half of the population living with HIV in South Africa were enrolled into the ART programme with coverage differing across provinces. The benefits of ART are to improve the quality of life by reducing morbidity from AIDS-related illness while also improving life expectancy by reducing mortality related to AIDS. However, benefits of ART treatment have not been felt among adolescents and young adults because of low uptake and adherence to treatment when compared to adults. Besides, adolescents and young adults may not be aware of their HIV status, thus delaying treatment for HIV. Despite efforts from the national government, levels of condom use among youth may be low, with only a 21% of 15-19 years and 17% of 20-24 years-old using condoms during their last sexual act and more than 41.1% of youths reporting more than two sexual partners in 2007 (Reddy, James, Sewpaul, & Koopman, 2008). Even though levels of HIV knowledge are high, perceived vulnerability and condom use were reportedly low. Understanding risk factors for risky sexual behaviours among adolescents and young adults is important for informing programmes and policies that aim to reduce outcomes of HIV infection and unwanted pregnancy.

The prevailing levels of HIV infection and unwanted pregnancy among adolescents and young adults points to a serious problem of unsafe sexual activities in South Africa. Unsafe sexual practices are the topmost risk factors contributing to disease and disability among South African youths as calculated through disability-adjusted life years (Zuma et al., 2011). A culture of multiple sexual partnerships, low utilisation of condoms, and early sexual initiation are common practices among South African adolescents (Shisana et al., 2009; Zuma et al., 2010). The South African government has cited the prevailing levels of risky sexual behaviours as one of the important challenges facing the country (DoWPD, 1998; Maharaj, 2006). There has been a renewed urgency in preventing unwanted pregnancy and STIs among adolescents and young adults. In addition to abstinence, this could be achieved through: delaying age at sexual initiation so that adolescents and young adults are better equipped for safe sexual activity, correct and consistent use of condoms, and by practising mutual monogamous relationships.

Even though the Western Cape Province reports the lowest HIV prevalence of all South African provinces, prevalence of teenage childbearing is a major challenge and points to high levels of unprotected sexual activities (Dinkelman, Lam, & Leibbrandt, 2007). More than any other region of South Africa, urban Cape Town consistently reports disparities in earnings and income, and poor education outcomes among the African and Coloured populations (Kleinschmidt, Pettifor, Morris, MacPhail, & Rees, 2007; Lopman et al., 2007). The pronounced socio-economic disparities expose disadvantaged adolescents to a variety of risk factors for sexual behaviours. The use of the Cape Area Panel Study (CAPS) data provides an ideal opportunity to study determinants of risky sexual behaviours among diverse populations and in settings with high socio-economic inequality. Therefore, understanding determinants of risky sexual behaviours of

early age at sex debut, multiple sexual partnerships, and inconsistent condom use would contribute to existing literature for the urban Cape Town area and South Africa in general.

Research findings from cross-sectional studies have shown that sexual behaviours are associated with socio-demographic characteristics such as education and population groups (Furstenberg, 1987). However, limited quantitative literature is available from longitudinal studies in the context of South Africa on factors that predispose adolescents into sexual transitions and sexual behaviour decisions. Research findings emanating from cross-sectional data inform on associations and have reduced power to make inference on the causes, therefore, using a longitudinal approach has the advantage of making causal inferences on outcomes.

1.1 Problem Statement

Despite the wide recognition that teenage pregnancy and prevailing rates of HIV among adolescents and young adults in South Africa are important national challenges, there is a dearth of literature on ecological determinants of risky sexual behaviours among adolescents. In addition, it is unclear whether the effect of risk factors act cumulatively, as this has not been tested before in South Africa. Even though risky sexual behaviours of early age at sex initiation, multiple sexual partnerships, and inconsistent use of condoms may be rampant among South African youth, more research is required to inform on formulation of effective interventions. Due to the challenges of unwanted pregnancy in young women and prevailing levels of new HIV infections among adolescents and young adults in South Africa, investigating the determinants of risky sexual behaviours in this population will contribute significantly to addressing these twin problems. Further, there is need to understand risk factors for risky sexual behaviours, and testing whether significant factors occur only at the individual level or whether community and

household factors contribute significantly. In addition, testing whether ecological risk factors for risky sexual behaviours among adolescents and young adults have a cumulative effect is an important contribution to existing literature. It is important to understand whether increasing number of risk factors present in the ecology of an adolescent or a young adult, correlates to an increasing likelihood of reporting risky sexual behaviours. If indeed risk factors exist at all levels of the ecology including community, household and individual levels, and act cumulatively, findings from this study would inform design of interventions that seek to improve outcomes of sexual behaviours. These interventions not only targets individual or household level factors but also factors at the community where adolescents and young adults develop. Intervention programs that recognise the dynamic interaction between risk factors at the various levels of the ecology might be more successful in mitigating the effect of risky sexual behaviours. An integrated intervention would consider all significant risk factors and provide a comprehensive package that facilitates change in sexual behaviour change or supports economic empowerment, and gender equity in sexual reproductive decision making.

In recent years, a number of studies have reported on correlates of risky sexual behaviours among adolescents in South Africa. Zuma et al (2011) reported on determinants of age at sexual debut identifying age, gender, geographical location, and level of education as important factors for sexual debut (Zuma et al., 2011). Onoya et al (2008) reported on determinants of multiple sexual partnerships in South Africa, identifying gender, race, history of STI and suspicion in relationships as major factors (Onoya et al., 2015). Moyo et al (2008) examined the correlates of consistent condom use among the youth in South Africa and identified discussing condoms between partners, duration of relationship, with reduced condom use in long term relationships (Moyo, Levandowski, MacPhail, Rees, & Pettifor, 2008). A review of available literature in

South Africa indicates that the effect of risk factors occurring at individual, household, or even community level have only been considered in isolation and no attempt has been made to describe their cumulative effect on the outcomes of risky sexual behaviours. While many of these studies have reported on disparate factors related to consistency in condom use, multiple partnerships, and early sexual activity, no study has tried to integrate factors at individual, household, and community level to assess their cumulative effect on these risky sexual behaviour outcomes. Furthermore, studies have mainly considered factors at the individual and household level, without assessing the effect of community level variables including education, income, and marital status (Stephenson, 2009).

Studies of adolescent sexual behaviours in developed countries including the US and the UK involved assessing whether the effect of ecological risk factors tends to be cumulative. Basing their work on the ecological systems perspective, proposed by Bronfenbrenner (1979), risk factors on individual, household, and community level are investigated (Bronfenbrenner, 1979). Bronfenbrenner further explores human development using ecological models to study child development (Bronfenbrenner, 1994). In addition to this approach, a few studies have further reported on the cumulative effect of risk factors at ecology level and how they integrate together to influence the risky sexual behaviour outcomes among adolescents. Small & Luster et al (1994) investigates on adolescent sexual activity in the US applying a cumulative risk factor approach (Small & Luster, 1994). No studies in South Africa or Africa have attempted to describe the cumulative effect of risk factors on risky sexual behaviours, as these have traditionally been considered in isolation.

This thesis investigates risk factors for the three sexual behaviours of early age at first sex, consistency in the use of condoms, and multiple partnerships using the ecological framework and

integrating the aspect of cumulative risk. Risk factors investigated appear in the ecology at individual, household, and community level where significant factors are integrated and tested on whether they have a cumulative effect on predicting adolescents' risky sexual behaviours. Therefore, this study was the first in South Africa and generally in Africa to investigate on the cumulative effect of ecological risk factors on negative outcomes sexual behaviours among adolescents and young adults. If indeed the effect of ecological risk factors is cumulative, a more comprehensive intervention programme would be recommended, targeting all levels of the ecology. In this thesis, I argue that individual, household, and community factors acted in a cumulative manner to influence sexual behaviours among adolescents and young adults. This contradicts the current practice where interventions for sexual behaviours are targeted to isolated risk factors like counselling without an enabling context. Findings from this study, informs whether cumulative risk approach is efficient, and draws on implications for policy and research that impact on demography and population studies.

Importantly, available literature on risky sexual behaviours in South Africa have mainly analysed cross-sectional datasets, to investigate on the relationship between ecological factors and sexual behaviours. In many studies of sexual behaviours in South Africa, cross sectional studies have often been used to draw conclusions and inform policy on determinants of sexual behaviours among adolescents and young adults (McGrath, Nyirenda, Hosegood, & Newell, 2009). The major challenge posed by using cross-sectional datasets is that causes of observed outcomes are difficult to ascertain, and therefore policy decisions from research may be based on unreliable evidence. Using longitudinal data improves the quality of evidence, as information on causes and determinants is more reliable, and this approach bests informs policy decisions. Also, trends and changes in sexual behaviours of the same sample observed over a duration of follow-up can be

described, and informs on and direction of outcomes of interests. This study utilise the longitudinal Cape Area Panel Study (CAPS) datasets, where adolescents are followed for close to 10 years, therefore, reliable conclusions on trends and determinants of risky sexual behaviours could be drawn. This further contributes to existing to literature and support or dispute previous study findings on trends in early age at sexual initiation, multiple partnerships, and consistency in the use of condoms (Baumer & South, 2001). Studies in South Africa have identified a number of individual level factors that influence sexual behaviours (Harrison et al., 2012; Zuma et al., 2010). Studies emanating from developed countries have further examined the role of contextual variables such as peer influence, parental relationships, and community monitoring, have been investigated (Small & Luster, 1994). Yet, the effect of contextual variables has not been adequately described in the context of South Africa.

Researchers in the US identified potential themes that can inform HIV prevention efforts in sub-Saharan African countries. Billy (1985) proposed a multi-level approach while studying factors predicting sexual transitions among adolescents (J.O. Billy, Brewster, & Grady, 1994; J. O. Billy & Udry, 1985; Small & Luster, 1994; Stephenson, 2009). Bronfenbrenner (1979) further proposed an ecological systems framework, stating that to understand the process of human development, one has to consider the entire context in which growth occurs (Bronfenbrenner, 1979, 1986, 1988). Small (1994) further applied a cumulative risk factor approach in an ecological framework to test whether factors at individual, household, and community level act cumulatively to predict adolescents' sexual activity (Small & Luster, 1994). Findings showed strong evidence that ecological risk factors had a cumulative effect on sexual activity, suggesting that as more risk factors became present in adolescents' lives, a higher proportion reported sexual experience. Despite strong evidence indicating that sexual behaviours are influenced by

the context in which adolescent develop, and that community, social and economic characteristics shape teenagers' expectations of their adult life and consequently their sexual behaviours, no such findings have been reported for South Africa. In a study of community influences on young people's sexual behaviour in Burkina Faso, Ghana, and Zambia, Stephenson (2009) identified that risk factors occurred at the three levels of ecology, with the mechanism through which the community context shaped sexual behaviours varying among young men and young women (Stephenson, 2009). No single study in South Africa has integrated ecological factors into a unified understanding of how they affect adolescents' sexual behaviours (Dinkelman et al., 2007; Dinkelman, Lam, & Leibbrandt, 2008).

Because of the challenges facing South African adolescent and young adults, there is need to investigate ecological determinants of risky sexual behaviours using longitudinal data, and understand whether significant risk factors have a cumulative effect on outcomes of sexual behaviours. Therefore, using the longitudinal CAPS data provides an opportunity to investigate on contextual factors that determines outcomes of risky sexual behaviours, and whether the ecological effect of significant risk factors have accumulative effect. Studies from developed countries including the UK and US have identified potential risk factors, even though these have not been tested in the context of South Africa. Because of the differences in context, it is inherent that findings from Western countries may not apply in the context of South Africa. This study applied the ecological systems framework as proposed by Bronfenbrenner (1979) to organise risk factors and apply a cumulative risk index approach that integrates ecological factors into a unified understanding. The performance of this theoretical framework has not been assessed before in South Africa despite strong literature supporting its application in developed countries (J.O. Billy et al., 1994; Small & Luster, 1994).

Investigating ecological factors and their effect on risky sexual behaviours among adolescents and young adults in South Africa contributes to demography and population studies in many ways. Firstly, understanding determinants of risky sexual behaviours would further our understanding on components that affects mortality and fertility related to HIV infection, due to increased mortality related to HIV and AIDS. Furthermore, complications from childbearing for adolescent girls contribute significantly to maternal mortality of affected countries, and affect future trends in fertility. Increased mortality and reducing fertility among adolescent women affects important components of a population that is key to population trends and projections and thus affect the demographic dynamics of a population. Besides, understanding aspects of sexual and reproductive health outcomes, is an important aspect of population studies.

1.2 Relevance to Demography and Population Studies

It is important to study the aspect of risky sexual behaviours among adolescents and young adults in the field of demography and population studies. Globally, risky sexual behaviours have been linked to increased negative outcomes of sexually transmitted diseases including HIV, and unwanted pregnancy among adolescents and young adults. For instance in the UK, incidence of the most commonly observed STIs tend to occur more among young people under the age of 25 years (PHE, 2013). The prevalence levels of chlamydia are highest among 18-19 year-old women at 4.7% and 3.4% for men aged 20-24 years, while for human papillomavirus women aged 18-19 years have the highest rates at 29.6% followed-up by those 20-24 year-old women at 26.6%. Risky sexual lifestyles among adolescents and young adults, such as multiple sexual partnerships, sexual intercourse without condoms, and early sex have been attributed to the observed high levels of STIs in the UK. In the US, youths aged between 13 and 24 years

accounted for an estimated 22% of all new HIV infections in 2014 and reported the lowest rate of ART uptake of any group. According to the Youth Risk Behaviour Surveillance System (YRBS), which monitors health risk behaviours that contribute to mortality and disability in the US, only 34% of high school students reporting sexual intercourse in the last three months had used a condom at last sex (CDC, 2015).

The impact of AIDS on population estimates has been more pronounced for countries in sub-Saharan Africa and particularly Southern Africa. People living with HIV and AIDS are more susceptible to developing other illnesses and infections because their immune systems are compromised. Opportunistic diseases including tuberculosis and pneumonia become lethal in the presence of HIV infection. In sub-Saharan Africa, mortality rates among all-ages are significantly higher than expected factoring the impact of HIV infection on mortality. The increase in mortality related to AIDS has a profound impact on life expectancy. In Lesotho for example, 25% of the population are living with HIV and life expectancy between 1990 and 1995 was estimated at 60 years but reduced to 34 years in 2005-2010, primarily because of AIDS deaths (UNPD, 2004). In South Africa, the AIDS epidemic has resulted in one of the most destructive health crises of recent times. In 2014 alone, UNAIDS estimated that 140 000 [100 000 – 190 000] had died from AIDS-related illnesses, with adolescents and young adults contributing a significant proportion to the total deaths (UNAIDS, 2015).

However, with the introduction of ART treatment, people living with HIV and initiating ART treatment early can expect to live a normal life when treatment adherence is optimal. In Kenya, the population-level impact of ART was a drop in adult mortality related to AIDS, with a decline of 34% for all causes and 26% for AIDS/tuberculosis (Gargano et al., 2012). Estimated AIDS-related deaths among adolescents has been increasing despite declines in other age-groups and is

attributed to low initiation and adherence to ART treatment (CDC, 2012). Besides, only a small proportion of youths test for HIV particularly among males, further impedes on efforts to initiate youths to care and treatment services.

The significantly increased mortality associated with HIV infection compromises survival rates for birth cohorts and has serious implications for population projections and planning for service delivery. Mortality attributable to AIDS plays a significant contribution to population size, characteristics, and well-being of any country. Countries that have been hard hit by HIV have seen mortality rates increase drastically combined with a significant reduction in life expectancy. The AIDS epidemic had a significant impact on population dynamics especially for countries in Southern Africa according to the projections of UNPD, the US Bureau of Census, and the World Bank (Jamison, Feachem, & Makgoba, 2006). In many country life tables, increased mortality attributed to HIV and AIDS has been incorporated, and then overall mortality is projected into the future together with other components that project population sizes into the future.

The effect of HIV and AIDS on age-sex composition results from drastic increased mortality and reduced fertility in age categories of countries that are highly impacted. Age-sex structure of a population is the number or proportion of males to females in each age category and is determined by a combination of past trends in fertility, mortality, and migrations. A prevailing high fertility (average number births per woman) among many countries in sub-Saharan Africa and a relatively small population, the overall impact of AIDS epidemic on total population has not been a significant drop in projected estimates. However, differentials in fertility preferences for women living with HIV, and increased AIDS-related mortality among adults in reproductive age-groups has contributed to slowing population in some countries including Botswana and Lesotho. Ordinarily, in countries without generalized HIV epidemics, deaths occur among the

very young and the very old. However, with generalized HIV epidemics, additional deaths occur among adults aged 20 to 49 years, which impacts on fertility outcomes. Deaths of large numbers of women in their reproductive years and the lower survival prospects of infected children reduces fertility and impacts on the population estimates of any affected country. The aspect of mortality and fertility impact on demographic theory that is important for the study of demography and population studies.

The impact of HIV on fertility preferences is important, with perceived intentions to child-bearing changing because of mother-to-child transmission of the HIV virus. In Mozambique for example, perceived risk of HIV acquisition was related to speeding up child-bearing, or wanting to stop having children (Hayford, Agadjanian, & Luz, 2012). In Africa, there is evidence that HIV and AIDS reduces fertility rates both at an individual and population levels (Kaida et al., 2006; Zaba & Gregson, 1998). Fertility rates of HIV-positive women is reportedly lower than that of HIV-negative women in all but the youngest age-group, and the effects increases with increasing age and the duration of the HIV epidemic (Chen, Philips, Kanouse, Collins, & Miu, 2001). It is estimated that HIV-positive women have reduced fertility and report an estimated 25-40 percent reduced birth-rates compared to HIV non-infected women and this difference causes a substantial population decline (Yeatman, 2009; Zaba & Gregson, 1998). Therefore, HIV infection may influence fertility intentions and consequently affect the population, even though the direction of effect remains contentious (Chen et al., 2001; Cooper et al., 2007; Cooper et al., 2009). Perceived risk for HIV infection may correlate with change in sexual behaviours that have effect on fertility. People living in areas with prevailing HIV epidemic may adopt sexual practices that drastically reduce child-bearing tendencies for fear of contracting HIV infection (Baylies, 2000; Yeatman, 2009). In Malawi for example, HIV positive test results reduced the

childbearing desires among respondents, with self-assessed likelihood for HIV infection also important (Yeatman, 2009).

Furthermore, studying risky sexual behaviours of a population is important for the field of demography and population studies because of the effect of unwanted pregnancy among adolescents and young adults on morbidity, mortality and future fertility trends. The WHO estimates that about 16 million girls aged 15 to 19 and about one million girls aged below 15 years give birth every year, and these births mainly occur in low-and-middle income countries. Complications related to pregnancy and childbirth is the leading cause of deaths for 15-19 year-old girls globally. Yearly, the WHO estimates that about three million girls aged 15 to 19 years undergo unsafe abortions, while babies born to teenage mothers face increased infant mortality compared to women 20 – 24 years. In the US, an estimated 1,058, 000 induced abortions were performed in 2011, with 540, 000 of the induced abortions performed to adolescent and young adult girls (Jones & Jerman, 2014). According to the Guttmacher Institute that tracks abortion in the US, almost 20% of all abortions are performed on teenage girls younger than 20 years, with over 40% of these abortions taking place when parents are unaware (Guttmacher & Instititute, 2004). Effects of abortion on adolescent and young adults have been well documented, ranging from physical to psychological harms, which develops well beyond their adulthood (Sobie & Reardon, 2001). Teens who have aborted were found to be six times more likely to attempt suicide, three times more likely to be admitted to mental health hospitals, and more likely to abuse drugs compared to teens who have had no abortion. Complications that arise with induced abortion include morbidity and mortality that arise from sepsis and vaginal haemorrhage.

Mortality related to abortion has a significant contribution to maternal mortality in developing countries, even though; information on abortion outcomes in sub-Saharan Africa is scarce.

Activists for legalizing abortion argue that restrictive laws on abortion contribute to increased maternal mortality (Koch, 2015; Koch et al., 2015). Many countries in sub-Saharan Africa have restrictive laws on abortion, thus adolescents and young adults seek abortion services from unqualified health personnel. In South Africa, abortion has been legalized since 1996, with scanty literature on abortion estimates, and the contribution of abortion to maternal mortality.

The socio-economic impact of both HIV infection and teenage pregnancy are obvious. HIV and AIDS mainly affect the household, health care system, business and agriculture, and economic stability. The tragic and untimely loss of parents and productive citizens affects families, farms, workplaces, schools, health care systems, and governments. At the family level, taking care of family members suffering from HIV has both financial and emotional implications, with possible loss of income and the cost of seeking treatment distorting family finances (Baranov, Bennett, & Kohler, 2015). The HIV epidemic has already crippled many health care systems in Africa, where systems have been weak even before the epidemic. In summary, studying sexual risky behaviours is relevant to the study of demography and population studies, because of the negative outcomes of teenage pregnancy and HIV infection among adolescents and young adults on mortality, fertility, and general wellbeing.

1.3 Literature Review

In this section, available literature on study objectives was reviewed, firstly at the global level, in sub-Saharan Africa, and in the context of South Africa. Literature on sexual behaviours reviewed included trends in early age at sex initiation, multiple sexual partnerships; and condom use at last sex encounter. Available literatures on determinants of risky sexual behaviours were reviewed, with risk factors postulated to occur at individual, household and community levels. Reviewing

available literature highlighted gaps, and provided a strong case for the need of this study, essentially complementing gaps in available literature.

This chapter also reviewed the use of theoretical and conceptual frameworks that were relevant to this research to facilitate analysis of the problem and arrive at valid conclusions. This study has adopted the ecological systems framework where risk factors were grouped according to the individual, household, and community levels. The conceptual framework adopted the ecological systems framework where risk factors appear at the three levels of the ecology, and assesses whether these factors act in a cumulative manner to affect outcomes of risky sexual behaviours.

1.3.1 Methods of literature review

Literature from relevant sources was reviewed to inform this study topic. Online databases were sourced for peer reviewed articles, conference abstracts and presentations, search engines, websites of specialist institutions, and key researcher publications were reviewed to understand existing literature and identify gaps in the topic. Open access materials and online catalogues were accessed through University of the Witwatersrand. Where existing research findings were quoted to build argument in this study, a reference was made indicating the authors and year of publication. EndNote software was used to manage selected references because of its relative ease to use and manipulation. Topical books and electronic books (e-books) were accessed through the Wits University Library Services. A literature review annex was developed with what existing literature contributes and potential gaps that would contribute significantly to literature when addressed. The annex was constituted as a matrix and appears at the appendix of this thesis.

Relevant articles to this study were screened first by title, and then abstract and included articles were read in full text and referenced to inform literature for this study. Peer reviewed articles and 'grey' literature (materials and research produced by organizations outside of academic or commercial publishing) from reputable organisations were referenced in this thesis. Open access articles were searched from the Internet through PubMed, a website that has over 26 million citations for biomedical literature from MEDLINE, life sciences journals, and online books. Additional online searches were conducted through established clinical, behavioural, and demographic research websites including JSTOR, BioMed Central, Google Scholar, and AJOL. Traditional search engines including Google, Yahoo, DuckDuckGo, Wikipedia, and Bingo were used to search for related literature on the internet. Literature from 'grey' mainly sourced from reputable institutions including Centers for Disease Control and Prevention (CDC), United Nations (UNAIDS, WHO, UNFPA, World Bank), US Bureau of Statistics, among other credible sources. Local South African institutions including Human Science Research Council (HSRC), South African National AIDS Council (SANAC), Department of Health (DoH), and Department of Social Development (DSD) were used to triangulate available evidence when possible.

A combination of terms were searched including terminologies related to; adolescents, young adults, HIV, AIDS, sexually transmitted infections (STIs), sexual, reproductive, risky behaviours, multiple sexual partnerships, concurrent partnerships, sexual debut, sexual transition, condom use, consistency, age at first sex, determinants, sub-Saharan Africa, Southern Africa, Tanzania, Kenya, Uganda, Zimbabwe, Malawi, Lesotho, Swaziland, Botswana, Zambia, South Africa, Western Cape, KwaZulu-Natal, Eastern Cape, Gauteng, Cape Town, Durban, and Johannesburg. A research folder was set-up where retrieved articles and web pages were saved in Adobe Acrobat (PDF) format, naming them according to the paper title, author, and year.

Various subfolders were developed related to topics, chapters, and sections that were relevant literature for the main thesis. EndNote software was used to manage references for this thesis because it is easy to search for online articles and easier to manipulate to a referencing style that suits academic writing requirements, while using keywords for searching materials.

1.3.2 Definition and concepts

In this thesis, early age at sexual debut was defined to imply penetrative heterosexual activity, reported by males or females before the age of 15 years. Participants were deemed to have achieved this outcome if they reported having first sex at age 15 or below. This cut-off point was based on the standard WHO/UNAIDS sexual behaviour indicators. Those who had no sexual experience at the age of 15 were considered as censored, and were grouped with the sexually inexperienced group for early age at sexual debut outcome.

Multiple sexual partnerships (MSPs) in this investigation were defined for adolescents or young adults reporting two or more sexual partnerships regardless of concurrency in the last 12 months. When more than one sexual partnerships occur in the same month, these were referred to as concurrent relationships, and present a heightened risk and were included in the definition of MSPs when occurring in the last 12 months. Multiple partnerships were therefore defined regardless of time of occurrence within the preceding year. In the CAPS survey, adolescent and young adults were asked whether they had intimate sexual relations with one or more partners in the last year, and also lifetime sexual partnerships. Existing evidence indicates that multiple sexual partnerships significantly contributes to sexually transmitted diseases including HIV (Green, Mah, Ruark, & Hearst, 2009; Halperin & Epstein, 2004; Mah & Halperin, 2010). In many countries of sub-Saharan Africa, reduction in HIV prevalence has been attributed to an ecological decline in multiple sexual partnerships, as experienced in the case of Uganda

(Asiimwe-Okiror et al., 1997; Hudson, 1993a). Of all changes in risky sexual behaviours, only reductions in sexual partnerships have been associated with a decline in the HIV prevalence (Gregson et al., 2006; Gregson et al., 2010; Hallett et al., 2006).

Adolescents and young adults are defined using standard WHO, UNAIDS and National Department of Health (NDOH) of South Africa, as persons aged between 10 to 24 years. For adolescents, the age range is 10 to 19 years, while young adults may comprise the age range 20 to 24 years. In this thesis, outcomes were defined for adolescents and young adults, an overlap that combines the two groups. This was a potential limitation even though combining analyses for both adolescents and young adults' may increase sample size improving precision and statistical power. A larger sample size may help draw a powered conclusion and make statistical inference statements that are representative of the general population represented by a sample.

1.3.3 Global perspectives on adolescent and young adult sexual behaviours

Globally, changes in sexual behaviours among adolescents and young adults have been observed over time. Research findings from the United States and the United Kingdom report a declining age at first sex and an increase in age at marriage (Blum, 2007; Fatusi & Blum, 2009). It has been reported that puberty and physical maturation are setting in earlier that may lead to an increase in premarital sexual activity associated with a wide availability of contraceptives (Blum, 2007; Fatusi & Blum, 2009). There was consensus that findings from research conducted among 15-19 year old persons living in urban areas of the United States shows an increase in the level of sexual activity in the 1970s (Zelnik, 1981). In other developed countries, a steady decline in using condoms at last sexual activity has been reported by 2011 (D. K. Eaton et al., 2011). Condom use differ significantly by gender, with males more likely to report condom use at last sex compared to females, with race differences also reported.

Studies in sub-Saharan Africa suggest that adolescents and young adults are sexually active just like their counterparts from developed countries, with rates of sexual activity during young adulthood rising or remaining unchanged in the last decade of 2000s (Hindin & Fatusi, 2009). In a review of trends in sexual behaviours in countries of sub-Saharan Africa, an estimated 25% of 15-19 year-olds reported sex before the age of 15 years, with differences observed for males and females (Doyle, Mavedzenge, Plummer, & Ross, 2012). In another study in the Democratic Republic of Congo, correlates of sexual debut among adolescents and young adults aged 15-24 years, were reported with age, being out of school, alcohol and peer influence significant (Kayembe et al., 2008). In Nyanza Province of Kenya, postponing first sexual activity was associated, for both males and females, with rejecting social myths, less peer pressure, and not knowing anyone dying of AIDS related illness (Tenkorang & Maticka-Tyndale, 2008). In urban Cape Town, perceived risk of HIV infection and higher knowledge were associated with adolescents and young adults' decision to engage in first sexual activity (Tenkorang, Rajulton, & Maticka-Tyndale, 2009).

Reports of condom use at last sex among adolescents and young adults in sub-Saharan Africa indicate an overall increase, even though prevailing levels of condom use were insufficient to reduce the spread of HIV (Bearinger, Sieving, Ferguson, & Sharma, 2007; Hindin & Fatusi, 2009; UNAIDS, 2011; Wellings et al., 2006). Gender differences in the use of condoms at last sex have been reported indicating that condom use was more prevalent in males than females but overall was inconsistent. Research reports in sub-Saharan Africa guide that females prefer using condoms mainly to prevent pregnancy than protection from STIs and HIV infections. In a secondary analysis of female data between 1993 and 2001 in eighteen countries in sub-Saharan Africa, use of condoms for pregnancy prevention rose modestly in 13 out of 18 countries even in

the presence of the HIV epidemic (Cleland & Ali, 2006). Multiple sexual partnerships have been practised in sub-Saharan Africa by adolescents and young adults. In a summarised study of sexual behaviours in sub-Saharan African, an estimated 20% of sexually active young men reported MSPs compared to only 10% of young women, reporting MSPs in the last 12 months (Hindin & Fatusi, 2009). The prevalence of self-reported multiple partnerships among young men may vary across countries in sub-Saharan Africa (Bingenheimer, 2010).

Studies in South Africa have also reported changes over time in sexual behaviours among adolescents and young adults (Katz & Low-Beer, 2008). Reports from three nationally representative surveys on HIV and sexual behaviours among 15-24 year old persons shows changes in age at sexual debut (Shisana et al., 2009). In males, 13.1% had sexual debut by age 15 years in 2002 compared to 11.3% in 2008, more than in females at 5.3% in 2002 and 5.9% in 2008 (Shisana et al., 2009). However, in three provinces, it is reported that the proportion of adolescents who are sexually active increased in the same period. A survey in KwaZulu-Natal Province of South Africa found that among adolescents aged 14-17 years, boys were more likely than girls, to report lifetime sexual activity at 37.7% compared to 13.8% (Harrison et al., 2012). In a large sample of junior secondary school students, 31.5% of both males and females were sexually active before the age of 15.75 years (Peltzer & Promtussananon, 2005). Eaton et al (2003) estimate that at least 50% of young people in South Africa were sexually active by age 16 years (L. Eaton, Flisher, & Aaro, 2003). In the Nelson Mandela /HSRC study of HIV/AIDS, sexual experience was reported at 25% amongst 15-17 years. Overall, the direction of the trend in sexual activity is unclear, and understanding the trends and changes in sexual activity remains an important undertaking.

In South Africa, an increase in the proportion reporting MSP among 15-24 year-olds between 2002 and 2008 was observed. Literature indicates that an estimated 15.9% reported MSPs in 2002 compared to 18.0% in 2008 even though those levels were not statistically different. However, multiple sexual partnerships significantly rose in males from 23.0% in 2002 to 30.8% in 2008 more than in females that showed a modest decline from 8.8% in 2002 to 6.0% (Shisana et al., 2009). Multiple partnerships were more prevalent in the age group 15-24 years than in the age group 24-49 years and 50 years and above. Other studies have reported contrasting findings, reporting a reduction in multiple sexual partnerships (Weir, Tate, Zhusupov, & Boerma, 2004).

Condom use among people aged 15-24 was observed to increase between 2002 and 2008, with this age-group reporting the highest proportion using condoms of any other age-group (Shisana et al., 2009). Condom use at last sex among the 15-24 year olds rose from 57.1% to 87.4% in males, and from 46.1% to 73.1% in females. Condom use in the general population has reportedly been increasing and this change has been attributed to a decline in HIV incidence (C. Marston & King, 2006). However, among adolescent learners, reports of unprotected sex are common in South Africa, with no fewer than 17,260 learners falling pregnant in KwaZulu-Natal alone in 2011, and close to 45,000 countrywide (Sowetan, 2011). However, evidence of condom usage levels in South Africa was inconclusive, as other studies reported declining trends in some age categories (Moyo et al., 2008; Versteeg & Murray, 2008). Trends in the use of condom among South African adolescents are unclear and show a wide variation by province and gender.

Globally, there is an established link between risky sexual behaviours among adolescents and young adults, and the field of demography and population studies. Outcomes associated with sexual behaviours affect fertility choices, birth rates and mortality aspects that have a profound effect on population dynamics. Adolescent girls in sub-Saharan Africa report the highest rates of

fertility for their age-group, and face the highest risk of pregnancy-related mortality, from delivery complications to pre-term deliveries (Lettenmaier, Liskin, Church, & Harris, 1988). Early childbearing may lead to increased maternal and infant mortality rates that can affect population growth. Furthermore, early childbearing may have effect on women's future fertility desires, birth rates and mortality, and socially destabilises marriage unions as early childbearing may occur of a family setting that is important for healthy child upbringing. In sub-Saharan Africa, early pregnancy may predict early marriage, associated with increased total fertility for women when natural family planning methods are used. Mortality rates among teenage mothers are exacerbated by lack of physical maturity required for child delivery by teen mothers (Yinger, de Sherbinin, & Ochoa L, 1990). A significant number of pregnancies in young women results in abortions, which coupled with restricted legislation in many African countries, may increase disability and deaths in young women. However, little evidence on relationship between early pregnancy and family size has been established due to paucity of data in sub-Saharan Africa.

In addition, effects of early pregnancy extend to new-born babies where infant mortality may increase, especially when births are preterm. Sample surveys in general population have limitations for detecting rare events, and fertility surveys targeting maternal mortality, do not record deaths among women with precision as women who have died will not be responding. The sisterhood method of estimating maternal mortality proposes an indirect measure of maternal mortality that may improve precision as it interviews about survival of all adult sisters(Trussell & Rodriguez, 1990). Besides, the effects of teenage motherhood on their new-born children on aspects of survival and fertility have been described in detail. Existing research shows that children born of teenage mothers may fail to reach their full potential (McDevitt, Adlakha, & Fowler, 1996). In Europe, the impact of teenage motherhood on education and

fertility outcomes of their children was a reduction in schooling time, and that daughters of teenage mothers were more likely to be teenage mothers themselves.

The impact of potential HIV infection among adolescents and young adults significantly contribute to the field of population studies. In many countries, HIV infection remains significantly associated with all-cause mortality among people living with HIV. In Tanzania, mortality rates were 15 times higher among people living with HIV than among HIV-negative persons, even though mortality rate has decline after antiretroviral roll-out (M. Marston et al., 2012; Urassa et al., 2001). In addition to increased morbidity and mortality from AIDS-related illness, the impact of HIV infection is generally a reduced desire for child bearing, thus affecting fertility rates and general population (Keogh et al., 2012). In summary, HIV infection results in mortality, and has fertility impacts that affect population dynamics.

1.3.4 Early sexual initiation in South Africa

Research findings indicate that a significant proportion of adolescents and young adults initiate early sexual activity, and socially marks the transition from childhood to adulthood. In many parts of the world, early sex initiation has been associated with a variety of concurrent risk factors and is important for teenage pregnancy, HIV infection and other sexually transmitted diseases in South Africa (Bearinger et al., 2007). In South Africa, AIDS contributes greatly to disease and disability among youths, as calculated through disability-adjusted life years (Zuma et al., 2011). The health hazards of early sexual activity are well documented by a number of studies that have investigated on negative impact of early sexual activity (McGrath et al., 2009; Zuma et al., 2011; Zuma et al., 2010). Studies have reported a strong correlation between ecological risk factors and initiating early sex. Researchers have argued that in communities where early childbearing is common, and HIV prevalence is high, adolescents may be at a

particular risk of HIV because of positive attitudes and permissiveness towards unprotected sex (Rutenberg, Kaufman, Macintyre, Brown, & Karim, 2003).

Onset of sexual activity among adolescents is an important marker of transition into adulthood that is usually embedded with social and personal meaning. Understanding circumstances of initiating into sexual activity is important, because it may be forced, and is a potential hazard for pregnancy and disease transmission (Baumgartner, Waszak Geary, Tucker, & Wedderburn, 2009; Lammers, Ireland, Resnick, & Blum, 2000). Adolescents, aged 10 to 19 years, are at a particularly increased risk of negative outcomes than any other age group (Bearinger et al., 2007). Numerous studies have linked transition into sexual activity with increased risk of unwanted pregnancy and HIV infection alongside other sexually transmitted diseases (Bearinger et al., 2007; S. C. Kalichman & Simbayi, 2005; McHunu et al., 2012; Rutenberg et al., 2003). These studies cite lack of experience in negotiating safe sex as a major risk when adolescents and young adults initiate sex. Early sexual activity has been described as an indicator of a hazardous lifestyle and could predict a future of a problematic life situation (S. C. Kalichman, Cherry, Cain, Pope, & Kalichman, 2005; S. C. Kalichman & Simbayi, 2005; Zuma et al., 2010). Understanding reasons why adolescents and young adults initiate sexual activity, as important implications for both theory, policy and practice.

Early sexual activity is important for South Africa because of the context adolescents and young adults grow-up in, the country has the highest number of people living with HIV of any other country in the world. The UNAIDS estimates for 2013 indicate that an estimated 6.3 million people were living with HIV in South Africa by 2013 (UNAIDS, 2013). Young people were disproportionally affected by the HIV epidemic, with youths in South Africa accounting for over 15% the global youth HIV population. The risk of HIV infection at an early age increases when

sexual activities are initiated early (Shisana et al., 2009). According to UNAIDS, youths in South Africa contributed significantly to the total number of new HIV infections in 2013.

At the same time, South Africa has one of the highest rates of teenage pregnancies around the globe, with an estimated 35% of adolescents reportedly becoming pregnant before the age of 20 years, and at least 30% giving birth at least once (Cunningham & Boult, 1996; Panday et al., 2009; Willan, 2013). The occurrence of teenage pregnancy hinders proper development of the girl-child and contributes to lost schooling opportunities for school attending girls (Furstenberg, 1976; Gyan, 2013; Taylor et al., 2014). Even though a high rate of school resumption and completion for teenage mothers is reported in South Africa compared to other countries in sub-Saharan Africa, disruption of schooling is associated with truncated educational attainment, and lowers future economic returns (Bhana, Morrell, Shefer, & Ngabaza, 2010; Marteleto, Lam, & Ranchhod, 2008; Taylor et al., 2014). Furthermore, early childbearing often puts young women at risk of morbidity and mortality from birth complication of obstetric fistulae and has been linked to higher rates of infant mortality (Clark, 2004; Gupta & Mahy, 2003; Zheng & Anderson, 2009). Young women choosing to terminate unwanted pregnancies are often met with unsupportive legal, socio-cultural, and religious systems in many countries in sub-Saharan Africa (Harries, Stinson, & Orner, 2009). Even though South Africa has a termination of pregnancy regulation, a variety of personal, societal, and health systems lead women to procuring unsafe abortions, thus exposing young women to injury, disability, and even death (Kagee, Toefy, Simbayi, & Kalichman, 2005; Odlind, 1997; Rutenberg et al., 2003).

The health hazards of initiating sex early are well documented by studies investigating on the determinants of early sex (McGrath et al., 2009; Onoya, Zuma, Zungu, Shisana, & Mehlomakhulu, 2014; Zuma et al., 2011; Zuma et al., 2010). Literature indicates that in

communities with high childbearing, HIV prevalence is high, and adolescents may be at an increased risk of HIV infection (Baumgartner et al., 2009; Rutenberg et al., 2003). This is particularly true for countries in sub-Saharan Africa where HIV is a generalised epidemic.

Studies reporting determinants of early sexual debut have reported on variation in rural-urban residence, socio-economic status, academic performance, and influence of peer pressure on the adolescent's sexual debut (M. W. Kalichman & Hinman, 2005; Klavs, Rodrigues, Weiss, & Hayes, 2006; Oljira, Berhane, & Worku, 2012). Research findings suggest that males begin sex activity earlier than females, and blacks begin sex activity at a younger age compared to whites (S. C. Kalichman, Simbayi, Jooste, Cherry, & Cain, 2005). In addition, physical maturation and biological development are important factors that lead adolescents and young adults to experiment with their sexuality. Other studies have reported on ecological that influence adolescents to engage in early sexual activities, including family disruptions, staying with single parents, parental supervision, perceived risk of STIs, community facilities, community health and state of the media (M. W. Kalichman & Hinman, 2005; S. C. Kalichman, Cain, Cherry, Kalichman, & Pope, 2005). Furthermore, lower family income, living in disadvantaged neighbourhoods, lesser parental supervision, and community permissive attitudes (S. C. Kalichman, 2005; S. C. Kalichman, Simbayi, et al., 2005).

In this study, ecological risk factors were investigated, and a cumulative risk factor approach applied to investigate whether significant risk factors had a cumulative effect on early sexual debut in urban Cape Town, South Africa. Available literature indicates that risk factors for early sexual debut among adolescents and young adults in South Africa have been studied in isolation, and no literature reports on their cumulative effect (Onoya et al., 2014; Zuma et al., 2011; Zuma et al., 2010). In existing literature conducted among studies in the USA, a cumulative risk factor

approach was adopted to integrate factors occurring at individual, household, and community level (Bronfenbrenner, 1979, 1988; Small & Luster, 1994). This approach attributes outcomes of risky sexual behaviours to aggregates of risk factors emanating from the entire ecology. In this study, it was hypothesised that risk factors for sexual risky behaviours occur at multiple levels of the adolescent's life and that their effect tends to be cumulative, implying that as more risk factors become present in the lives of young people that was associated with an increase in the likelihood of initiating risky sexual activities.

Studying determinants of early age at sex initiation is relevant to demographic and population studies because of the important role early sex plays in early childbearing and HIV infection.

1.3.5 Multiple Sexual Partnerships in South Africa

The potential role of multiple sexual partnerships (MSPs) and sexual networks in transmission of HIV has been established in literature (Hudson, 1993b; Watts & May, 1992). Studies modelling on HIV transmission identify MSP and concurrency as significant components of the models by increasing the rates at which STIs move through sexual networks (L. Morris, Warren, & Aral, 1993; M. Morris & Kretzschmar, 1997). In sub-Saharan Africa, researchers have argued that HIV and AIDS epidemic has been chiefly driven by MSPs (Mah & Halperin, 2010; M. Morris & Kretzschmar, 1997). In settings of a generalised HIV and AIDS epidemic, viral load increases immediately after a new HIV infection, and transmission rates increases when sexual partners are newly infected. MSPs are risky, not only considering the number of sexual partnerships, but also at the ecology level where concurrency establishes sexual networks through which HIV is transmitted in the community. In conclusion, the risk of HIV transmission increases with more sexual contacts, as the likelihood of encountering an HIV infected partner increases when sexual contacts increase. Sexual contacts and networks are critical for the spread of HIV depending on

HIV prevalence in the general population. The infectiousness is high if the partner is newly infected, as the viral load is high after infection, and the likelihood of infection is higher if sexual contact is unprotected. MSPs are regarded as risky sexual behaviour because of the increased risk of HIV transmission through increased sexual contacts. Therefore, understanding the extent to which adolescents and young adults are engaging in MSPs, and determinants of MSPs in South Africa would inform policy and effective interventions.

In Southern Africa, researchers believe that multiple sexual partnerships together with unprotected sexual practices are important drivers of the HIV epidemic (Onoya et al., 2014). In a generalized HIV epidemic where men and women report more than one sexual partner, MSPs have been credited with the prevailing high levels of HIV infections. At a meeting of experts convened by Southern Africa Development Community (SADAC) and UNAIDS, the prevailing frequency of multiple sexual partnerships, low utilisation of condoms, and low levels of male circumcision were identified as the chief drivers of the HIV epidemic. These drivers were further worsened by socio and structural factors including gender inequality, wealth inequality, migration patterns where men migrate to seek for employment opportunities, male attitudes and behaviours, transactional and intergenerational sexual activities.

Studies have reported on multiple sexual partnerships among adolescents and young adults in South Africa. Findings discuss the increased risk young people in South Africa face because of the context they develop in, with the country having the highest number of people living with HIV in the world. The Human Sciences Research Council (HSRC) investigation on HIV Incidence and Behaviour in South Africa reported an overall increase in the trend of people having multiple sexual partnerships between 2008 and 2012 (Shisana et al., 2009). The HSRC investigation further indicates that unmarried people were twice as likely to report multiple

sexual partnerships compared to the married. These findings are relevant to young people who constitute majority of unmarried, as there has been reported shift in age at marriage that occurs at a relatively older age, which may encourage MSPs among young people. In a study examining determinants of MSPs using a nationally representative survey, the prevalence of MSPs was higher in men than women, while race, history of STI, being in short term relationship found to be significant (Onoya et al., 2014). The last South African Demographic and Health Survey (SADHS) conducted in 2003 provided insights into levels of MSPs, indicating a high frequency of MSPs among young people. Research indicates that women and young girls who engaged in MSP were mainly driven by poverty and deprivation, forming transactional partnerships based on exchange of sex for social and financial gains (Onoya et al., 2014). Further, studies in South Africa shows that individuals reporting MSPs are more likely to be HIV-positive further increasing the risk of HIV transmission.

To reduce rates of HIV transmission in a generalized epidemic, changing sexual behaviours is important, particularly discouraging multiple sexual partnerships and promoting condom use. MSPs that are concurrent and long term pose a particularly heightened danger for HIV transmission at the ecological level, as condom usage has been reported to be low in long term partnerships (Westercamp et al., 2010). Influencing sexual behaviour of multiple and concurrent sexual partnerships remain a challenge to policy makers in South Africa. Studies in South Africa have mainly used cross-sectional data to study on determinants of MSPs. In this study, determinants of multiple sexual relationships are investigated using a panel data, and risk factors are organised at three levels of ecology to include factors at individual, household, and community level. Determinants of multiple sexual partnerships among adolescents and young adults were identified and discussed, and interventions for reducing MSP are proposed.

1.3.6 Condom use among adolescents and young adults in South Africa

Correct and consistent use of condoms has been found to be effective in preventing heterosexually transmitted HIV and STIs by more than 90% (MacPhail & Campbell, 2001; Nyembezi et al., 2014). For family planning purposes, condoms expand the choice, have no medical side effects and provide dual protection against unwanted pregnancy and STIs. Globally, condom programs are recommended as a highly effective way of preventing HIV, teenage pregnancy, and are generally regarded as acceptable to adolescents and young adults (Chandran et al., 2012). However, despite the effectiveness of condoms in preventing HIV and STI transmission, condom use in sub-Saharan Africa has been described as rare, calling for a better understanding of how condoms fit within sexual practices especially among adolescents and young adults (Adedimeji, Heard, Odutolu, & Omololu, 2008; Adedimeji, Omololu, & Odutolu, 2007; Maticka-Tyndale, 2012). Recent evidence from a number of studies in sub-Saharan Africa shows a steady decline in condom use at most recent sexual intercourse. In sub-Saharan Africa, adolescents and young adults are at an increased risk of HIV/STIs and unplanned pregnancies because of insufficient condoms utilisation (Doyle et al., 2012). The United Nations target of cutting down new HIV infections by 50% in sub-Saharan Africa has been greatly hindered by reduced condom utilisation among adolescents and young adults (UNAIDS, 2013).

Studies in South Africa have described sexual activity among adolescents and young adults as unsafe (L. Eaton et al., 2003; MacPhail & Campbell, 2001). According to a nationally representative household survey released by the Human Sciences Research Council, South African adolescents and young adults are reporting more sexual partners and reduced condom use in their last sexual intercourse (Kaplan, Jones, Olson, & Yunzal-Butler, 2013). It was reported that condom usage among young men aged 15 to 24 years in 2012 was 67.5% compared

to 85.2% in 2008 (Kaplan et al., 2013). A similar trend was observed for men aged 25 to 49 years where condom use fell from 44.1% to 36.1% over the same period with an estimated 52.9% reporting not using condoms. In a household survey conducted in the Free State province of South Africa, 38% of respondents reported always using condoms, while 61% used them during the last sexual intercourse (Chandran et al., 2012). According to the National Strategic Plan for HIV and TB, correct and consistent condom use is a pivotal strategy if the South African government is to reduce new HIV infections (NSP, 2012). The South African government and NGOs have partnered to promote uptake of condoms by using media campaigns, free distribution, and using existing healthcare systems. Condoms are now provided for free by the government of South Africa in government offices, learning institutions and healthcare facilities (Wamoyi, Mshana, et al., 2014).

With HIV and AIDS epidemic, teenage pregnancies, and other STIs posing challenges to the government, there is a need to understand why adolescents and young adults engage in risky sexual activities. It is unclear why condoms may not be widely adopted even though they are effective in for family planning and preventing HIV infections. Interventions for increasing uptake of condoms in sub-Saharan Africa have often produced discouraging results (Maticka-Tyndale, 2012). Authors argued that condom use in relationships among youth in sub-Saharan Africa involves complex interpersonal and social dynamics. A general decline in using condoms has been reported in long-term partnerships even though consistency in using condoms was high in casual and short term partnerships (Westercamp et al., 2010). Perceived risk of HIV infection was associated with an increase in condom use among youth in Madagascar, Ghana, and Cameroon (Meekers & Klein, 2002; Meekers, Klein, & Foyet, 2003; Wamoyi, Wight, & Remes, 2014). In Zimbabwe, ability to persuade a partner to use a condom and being personally

concerned about acquiring HIV infection was positively associated with use of condoms at last sex (Ngome & Odimegwu, 2014). In a study assessing the effect of mass media on HIV/AIDS related behavioural outcomes, socio-economic status was a significant predictor of condom use (Wamoyi, Mshana, et al., 2014). In another study conducted among university in Ugandan, males were more likely to use condoms with a new sex partner, while students with inability to correctly use condoms were less likely to consistently use condoms (Wamoyi & Wight, 2014b).

In South Africa, condom use has reportedly been associated with younger age groups, male gender, the unmarried, and higher education levels. A higher percentage of urban residents were reported to be using condoms more consistently when compared to their rural counterparts. In addition, using condoms at first sex was associated with continued condom use in future sexual activity, and was associated with use at most recent sex encounter. Also, partner communication has been reported as a strong predictor of condom use among patients attending STDs clinics in South Africa (Wamoyi & Wight, 2014a). In addition, perceived need for condoms was the main predictor of condom use at last sexual intercourse, while knowing how to correctly use of condoms, condom availability, young age, being single and having a higher education were also important predictors of using condoms (Chandran et al., 2012).

Research has shown that sexual wellbeing is determined by a complex web of factors; ranging from sexual behaviour, personal attitudes, societal factors, to biological risk and genetic predisposition. Improving sexual wellbeing requires the integration of individual, family, and community level systems. A policy and legal framework together with an enabling regulatory context where sexual rights of all people are upheld is required. The importance of managing STIs is crucial in the fight against HIV epidemic in countries of sub-Saharan Africa. It is therefore evident that in order to change individual or group behaviour, this only has potential to

succeed if not done in isolation. Studies of sexual behaviour outcomes have often employed the use of cross-sectional datasets to investigate on determinants. In addition, commonly used methods of analyses have considered individual or group level factors in isolation. Recognizing the multi-faceted nature of risky sexual behaviour outcomes, a better understanding of factors that facilitate condom use is needed to reduce HIV infections among young people in South Africa. Many barriers to consistent condom use may not be overcome by strategies that only target individual characteristics and calls for intervention that change factors at contextual level. This is especially true for South Africa where substantial resources have been invested in prevention campaigns but there is no understanding if these are being used effectively to prevent the spread of HIV/STIs (Wamoyi, Mshana, et al., 2014).

Many studies have utilised cross-sectional datasets to understand determinants of condom use among South African adolescents (Nyembezi et al., 2014; Nyembezi et al., 2009; Wamoyi, Mshana, et al., 2014; Wamoyi & Wight, 2014a; Wamoyi, Wight, et al., 2014). These studies have often reported on disparate factors related to young people's sexual activities and condom use. In this study we utilise longitudinal data to investigate the extent to which contextual factors cumulatively act together to predict condom use at last sexual intercourse among young people in urban Cape Town.

1.3.7 Ecological risk factors for adolescent sexual behaviours

In South Africa, a number of studies have described factors that determine adolescents and young adults' sexual behaviours. Socio-economic deprivation has been reported to influence sexual behaviours at both individual and household level (Dinkelman et al., 2007, 2008; Macintyre, Rutenberg, Brown, & Karim, 2004; MacPhail & Campbell, 2001; Manzini, 2001; Varga, 2001; Zambuko & Mturi, 2005). Other factors reported to influence sexual behaviours

includes adult attitudes to sex, gendered power relations and the economic context of sex (Macintyre et al., 2004; MacPhail & Campbell, 2001). Available literature on ecological determinants has often highlighted community socio-economic status. High levels of community poverty were associated with increased unprotected sexual activity among young men, while higher levels of community cohesion were associated with delayed sexual initiation (Burgard & Lee-Rife, 2009; Dinkelman et al., 2008). What is unclear is the effect of community level factors including proportion of households employed, headed by females, means community education, and the mean household income. There is need for literature on ecological determinants of sexual behaviours in South Africa as very few studies have reported on the influence of broader society characteristics.

Findings from studies conducted in developed countries continue to provide basis for formulating hypothesis for studies conducted in sub-Saharan Africa. However, due to the differences in context, access to health care, socio-economic differences, findings from developed countries may not be applicable in the context of sub-Saharan Africa and South Africa in general. This calls for a dedicated effort to understand the relationship between ecological risk factors and outcomes of risky sexual behaviours in the context of South Africa.

1.3.8 Cumulative risk factor approach

Cumulative risk factor models have been used to study the effect of ecological risk factors on sexual behaviours among adolescents and young adults (Small & Luster, 1994; Sychareun, Thomsen, Chaleunvong, & Faxelid, 2013). The premise of this approach is that the effect of risk factors may be cumulative. This approach argues that as more risk factors become present in the ecology of adolescents and young adults, the more the likelihood of engaging in risky sexual behaviours. This approach has previously been employed in studying the early development of

children in the US, where deleterious effects of co-occurring risk factors on child behaviour outcomes were observed with increasing risk factors (Appleyard, Egeland, & Sroufe, 2007; Appleyard, Egeland, van Dulmen, & Sroufe, 2005; Eiden, Godleski, Colder, & Schuetze, 2014; Evans, Li, & Whipple, 2013). In addition, a cumulative risk approach has been used to model contextual factors associated with problems of youth behaviour (Gerard & Buehler, 2004). These analyses revealed a positive, linear relationship between cumulative risk and problem behaviours among the youth. In addition, Small (1994) presented strong evidence as to why a cumulative risk factor approach is useful for studying adolescents sexual activity. The US Environment Protection Agency has applied a cumulative risk approach to model environmental factors causing health problems. A toolbox for developing cumulative risk was developed after recognizing that people are exposed to a variety of environmental chemicals that may act cumulatively to impact on their health outcomes (Alves, Tilghman, Rosenbaum, & Payne-Sturges, 2012; Macdonell et al., 2013).

Research on multiple factor exposure has relied on the cumulative risk index (CRI) to measure cumulative risk. CRI is constructed by dichotomising the risk factor and scoring it as either present or absent, and finally summing the number of risk factors present. CRI has been widely used in human development, environment hazards, and modelling youth behaviour problems. The model reportedly has a number of advantages; firstly, CRI is sensitive even for small datasets, and this is important where large sample sizes are not easy to obtain. In addition, the CRI can model multiple risk factors parsimoniously because the metric is easy to calculate. Again, the CRI makes no assumptions about the relative strengths of the factors and every risk factor is included to contribute a similar risk. Most importantly, the CRI models are very compatible with an ecological framework as hierarchy is not important. However, these models

also present a number of limitations; to start with, risk is assigned arbitrarily, sound judgement has to be exercised to determine when a factor is considered to put an individual at risk, and judgement has to be based on existing literature. Secondly, dichotomising continuous data may result in data loss, and this has to be factored in when interpreting findings. Lastly, the CRI is additive which prohibits assessing interaction among risk factors. On the other hand CRI has a number of advantages (Evans et al., 2013). A review of literature demonstrates that cumulative risk models have only been used in developed countries and no single study has assessed the performance of these models in sub-Saharan African.

1.4 Deficiency in existing literature

In South Africa, findings from national and provincial reports show differing trends of risky sexual behaviours, and are difficult to interpret in the face of the HIV epidemic and high rate of teenage pregnancy in South Africa.(Shisana et al., 2009). A number of risk factors related to whether or not a young person engages in sexual activities have been reported, however, household and community level variables have rarely been investigated. It is important to understand the extent of contribution of the familial and community risk factors as these may even have a higher effect on outcomes of risky sexual behaviours. Understanding the contribution of community and familial level factors on outcomes of risky sexual behaviours among adolescents and young adults helps in the design of effective intervention programmes. In this thesis, familial characteristics of single parenthood, family relationships, school experiences and performances, religiosity, and employment at familial level are investigated. In addition, community level factors including the proportion of households headed by females and mean

years of schooling of household heads in a community, proportion of households living below the poverty line, and mean community income.

Most importantly, no single investigation in South Africa has reported on the cumulative effect of household and community risk factors. Research from developed countries demonstrated that the effect of ecological risk factors on adolescent sexual behaviour may be cumulative (Small & Luster, 1994). There were documented studies in South Africa and Africa in general that had investigated on the cumulative effect of ecological risk factors on adolescent sexual behaviours. Understanding whether ecological risk factors have a cumulative effect is crucial, which informs on the design of intervention programmes for risky sexual behaviours, bearing the synergies and interactions of factors at different levels. This study was the first to test the efficacy of a cumulative risk factor approach in modelling adolescent sexual behaviours in South Africa and by extension, sub-Saharan Africa.

Finally, outcomes of unwanted teenage pregnancy, and transmission of STIs including HIV have important implications for morbidity, mortality and population dynamics. These are important aspects of population aspects that are relevant for demography and population studies. Also, the effect of teenage pregnancy on future fertility trends especially in the context of sub-Saharan Africa has been reported, amid the difficulty occasioned by lack of sufficient data. Therefore, this study also relates the importance of understanding determinants of risky sexual behaviours to the study of demography and population studies.

1.5 The Purpose Statement

This study sought to analyse trends, patterns, and ecological determinants of risky sexual behaviours among adolescents and young adults in urban Cape Town, South Africa and further,

investigated whether significant risk factors had a cumulative effect on outcomes of of risky sexual behaviours.

1.6 Research Questions

- What are the levels, trends and patterns of risky sexual behaviours of early age at sexual initiation, multiple sexual partnerships, and condom use among adolescents and young adults in urban Cape Town, South Africa?
- Which risk factors occur at individual, household, and community level determine outcomes of early age at sexual initiation, multiple sexual partnerships, and condom use among adolescents and young adults?
- Do significant risk factors occurring at the different levels of the ecology act in a cumulative way to determine outcomes risky sexual behaviours among adolescents and young adults?

1.7 Research Objectives

1.7.1 General objective

To investigate ecological determinants of risky sexual behaviours among adolescents and young adults in urban Cape Town, South Africa and to assess whether identified risk factors have a cumulative effect.

1.7.2 Specific objectives

- To determine trends, levels, and patterns of sexual behaviours of early sexual debut, multiple sexual partnerships, and condom use among adolescents and young adults enrolled in urban Cape Town.

- To determine ecological risk factors for risky sexual behaviours of early age at sexual debut, multiple sexual partnerships, and low levels of condom use among adolescents and young adults in urban Cape Town.
- To test whether significant ecological risk factors have a cumulative effect on outcomes of risky sexual behaviours.

1.8 Definitions and Delimitations

This study utilises secondary data from adolescents and young adults aged between 14 to 22 years at the time of first survey. There is as potential for systematic differences between adolescents aged between 14 to 19 years, and young adults aged between 20 and 22 years, at the first survey with regard to reporting sexual behaviours. This was a particular challenge for the researcher – as early age at sex debut outcomes were defined for reported sex before 15 years, when majority of respondents were nearly past this age at time of first survey. The implication of this cut-off point is to reduce the sample size used for early sex initiation outcome that may consequently reduce power to make statistically powered conclusions from study findings. However, findings from this study were validated by adopting a longitudinal design approach, albeit with a smaller sample, has sufficient power to inform on causes of early sexual activity and inform recommendations for further research. Risky sexual behaviour indicator data were only available for heterosexual activity, implying the relationship between a male and a female, and missed potential information on homosexual relationships. However, literature estimates indicates that the occurrence of homosexual relationships is minimal among adolescents and young adults, and therefore may have little impact on the overall findings. In probability theory,

the central limit theorem establishes that in instances when independent random variables are added to a sample, their properly normalised sum tends to a normal distribution.

Also, this study, by using secondary data, is prone to obvious limitations, with the researcher having no input in the sample size requirements, site selection, and the variables collected. This may lead to omission of important indicators that could inform related research questions. However, the CAPS surveys were conducted by Population Studies Centers of reputable research teams at the University of Cape Town and the University of Michigan, with a comprehensive guide to site and sample selections. Sampling and site selection were backed by scientific considerations and study material reviewed and passed by ethical bodies affiliated to the universities. Since the study sites was in the City Cape Town, generalising the findings to South African young adults, was done with due consideration.

1.9 Significance of the Study

In South Africa, adolescents and young adults disproportionately bear the burden of the HIV and AIDS epidemic, with the country accounting for the highest number of youths living with HIV globally (Shisana et al., 2014). Even though recent trends may indicate that the HIV epidemic has stabilised, deaths related to AIDS among adolescents in South Africa have in fact been increasing due to low uptake of care and treatment services. On the other hand, levels of unsafe sexual activity among South African adolescents and young adults were described as high (International Group on Analysis of Trends in & Behaviours in Young People in Countries most Affected by, 2010; UNAIDS, 2009). Further, prevalence of other STDs in South Africa is described as high, that exacerbates HIV transmission (Johnson, Coetzee, & Dorrington, 2005).

The occurrence of pregnancy among adolescents and young adults further complicates the already delicate situation, as teenage fertility is reportedly high in South Africa, and often occurs outside of marriage where pregnancies are mainly unwanted (Marteleto et al., 2008; McHunu et al., 2012). Literature indicates that South Africa has one of the highest premarital fertility rates in the world, with some researchers arguing that the country's fertility relies less on marriage than most other African countries (Garenne, Tollman, & Kahn, 2000). Teenage pregnancies are associated with negative outcomes of medical and health complications for the mother, lost schooling time, higher school dropout rates, and a life encircled in poverty (Conde-Agudelo et al., 2005). Researchers argue that teenagers who become mothers out of marriage have lower education and earning outcomes as compared to peers who have children later (Dahl, 2010). Even though adolescent fertility rates may be declining, adolescent pregnancies remain a serious problem for parents, policymakers and social service providers (Panday et al., 2009). Infants and young children depend on their parents and care givers for provision of basic needs. Raising children requires personal, social and economic resources in order to maximize their potential. Young adults becoming parents too soon, before adult capabilities and the necessary resources are acquired, poses a potential limitation to both the parents and their infants. The need to meet the demands of a child may lead the young parent to drain resources from their extended families and society.

Currently, there is still urgency to reduce the burden of unwanted pregnancies and prevent new cases of HIV infection among adolescents and young adults in South Africa. The reduction in unwanted pregnancies and new HIV infection may only occur if young people adopted safe sexual practices. Apart from sexual abstinence, this can be achieved in three other ways: delaying sex initiation so that young people are better equipped to practice safe sex, practising

correct and consistent condom use among other effective contraception methods, and by practising mutual monogamous relationships. Effective interventions among adolescents are those programs that support their change in sexual behaviour to practising safe sexual practices. However, this calls for the understanding of current trends and determinants of sexual risky behaviours among South African adolescents and young adults.

Despite the global recognition that sexual practices place young people at an increased risk of acquiring unwanted pregnancies and HIV infection, advances in mapping sexual behaviours, especially in developing countries, have been slow (C. Marston & King, 2006). Recent analysis of trends in age at sex initiation and age at marriage indicates a decline in age at sex initiation and an increase in age at marriage, thus potentially increasing non-marital sexual activities (Hindin & Fatusi, 2009). The report further indicated that adolescent childbearing outside of marriage has been increasing for several years and at a rapid pace. In a rural South African setting, premarital fertility accounted for 47% of all births among women aged 12-26 years in the years between 1992 and 1997 (Garenne et al., 2000; Zwang & Garenne, 2008). A relationship between premarital fertility and HIV/AIDS in sub-Saharan African countries was established, with a modest positive correlation between HIV infection and premarital fertility (Garenne & Zwang, 2008).

Trends in age at sexual initiation in South Africa reportedly vary with region, race and rural-urban residence as important determinants. This study aims at adding to the existing literature body by quantifying trends and determinants of risky sexual behaviours among adolescents and young adults in urban Cape Town over a period of five years' follow-up.. In the general population, data from HIV patients on ART treatment in areas with high prevalence reveal a significant reduction in multiple sexual partnerships (McGrath, Eaton, Barnighausen, Tanser, &

Newell, 2013). The only recent national survey describing trends in multiple sexual partnerships among adolescents was the South African Demographic and Health Survey (SADHS) of 2003, no data since has described risky sexual behaviours among adolescents. Rural and urban differences were observed in the SADHS survey. To evaluate the future of the HIV epidemic in South Africa, it is important to understand current trends in sexual behaviours.

This study further seeks to further broaden risk factors previously investigated by examining additional risk factors for sexual risky behaviours among adolescents and young adults. The study organises potential risk factors at the three levels of ecology, to include risk factors at the individual, household, and community levels. This contributes to the existing global literature and enhances a better understanding of health issues among adolescents and young adults in South Africa. Our findings would provide a reference for South Africa from the largely American dominated research on community effects on adolescents. Understanding factors that determine a young person's decision to engage in risky sexual activity has important implications for theory, policy and practice. Effective interventions that have the most impact on delaying first sexual intercourse, reducing the number of sexual partners, and increasing condom use may lead to a decline in the transmission of HIV, and can slow population growth (Glasier & Gulmezoglu, 2006). Significant risk factors in the adolescent's ecology where potential interventions may have the most impact will be deduced, and recommended.

In developed countries, there has been an increased focus on cumulative risk approaches, where a combination of risk factors is modelled. Research in developed countries has applied these models to understand adolescent sexual activities where risk factors are organised in an ecological framework. The contribution of this study is unique because of the use of longitudinal datasets from the CAPS surveys. These surveys follows-up adolescents and young adults over

five waves of surveys and provides critical information on changes and causes of sexual and reproductive health behaviours. In many social research surveys, ecological variables have not been adequately captured, thus making it difficult to establish relationships between ecological factors and young person's sexual behaviours. Using the longitudinal CAPS survey data provided quality community variables that may contribute to the risk of reporting unsafe sexual activity among adolescents and young adults. This study is the first to test the application of a cumulative risk model for ecological risk factors with a longitudinal data globally, and the first in sub-Saharan Africa and South Africa to investigate the cumulative risk factor model for outcomes of risky sexual behaviours. Therefore, this contribution is unique for this study, as findings from this study would inform effective design of interventions and relevant programmes.

Lastly, this study links the important of sexual risky behaviours to the field of demography and population studies. Exploring the effect of risky sexual behaviour outcomes of HIV infection and unwanted pregnancy on fertility, mortality, and migrations is key to understanding the demographic theory, and furthers the contribution of knowledge in demography. While studying sexual and reproductive health among adolescents and young adults informs literature that are relevant to population studies.

1.10 Organisation of the Thesis

This thesis is arranged in the following manner: Chapter 1 contains the introduction to this work, an introduction to the current problem and background, and the contribution of this work in addressing the current problems. The focus was mainly on the problems occasioned by risky sexual behaviours exemplified by the twin problems of teenage pregnancy and HIV/AIDS

infection among young people in South Africa. It expounds on the complex relationship between HIV and unwanted teenage pregnancy and adolescent risky sexual behaviours. The advantages of using a longitudinal set of data are highlighted with the principle mention of trends, and causal determinants of adolescent risky sexual behaviours in the context of urban Cape Town. In a revised approach, the chapter also reviews in detail the available literature, and identifies potential gaps for study. The chapter highlighted the need for additional literature on the topic and the justification for using the more robust cumulative risk factor approach. The relevance of this study was also highlighted in defining the research questions and objectives, addressed in the course of the research findings. The limitations facing the analyses presented in this study and how they were addressed was discussed. A detailed discussion of the available literature on study objectives was presented in chapter 1 section 2, with a description of the methods used to identify relevant literature. A global perspective of the literature was first critiqued, narrowing down to sub-Saharan Africa, and then South African literature was reviewed to guide the research questions.

Chapter 2 introduces the theoretical and conceptual frameworks adopted for this study, and how assumptions of these models apply in the case of studying ecological determinants of risky sexual behaviours among young adults. Chapter 3 introduces the methodology of survey design, extensively describing the sample, and how the sample size was arrived at. The five waves of the survey used in data collection were described with the timelines when these were collected. Variables that were selected for analysis to answer to specific research questions are reviewed, and statistical methods applied to answer the specific research questions explained. Steps in data analysis were described, to provide the reader an opportunity to replicate some of the research steps undertaken. The construction of community variables was explained, and the justification

for choosing between logistic regression methods and linear discriminant analysis was explored. Potential limitations of the analysis that might affect the findings of the study were highlighted and how the limitations were addressed outlined.

The baseline descriptive statistics were reported in Chapter 4 where detailed socio-demographic characteristics are provided for the five waves of the survey. In addition, sexual and reproductive health indicators were analysed, presenting the baseline levels and trends over follow-up time. This responds to whether levels of reported risky sexual behaviours have been increasing or decreasing over time of follow-up. Chapter 5 reports on the findings of analysing the ecological determinants of early age at sexual debut. Univariate and multivariate risk factors were identified, and a cumulative risk factor approach was tested to assess whether risk factors acted cumulatively. Findings from analysing the ecological determinants of multiple sexual partnerships were reported in Chapter 6, where both univariate and multivariate risk factors are identified, and a cumulative risk factor approach is assessed. Chapter 7 investigates the levels, trends, and determinants of inconsistency in the use of condoms among adolescents and young adults.

The experience of testing a cumulative risk factor approach was discussed in Chapter 8, where factors at individual, household and community level significant in the multivariate models are integrated into a risk factor approach. Chapter 9 reviews and discusses observations from the whole thesis that are relevant for answering the research objectives. The discussion focuses on relevant findings for levels and trends of risky sexual behaviours, and the ecological determinants of the three risky sexual behaviours defined and investigated for this research. The use of a cumulative risk factor approach was discussed. Conclusions of the thesis findings were outlined in Chapter 10, with relevance to policy and potential areas for future research proposed.

CHAPTER 2: THEORIES AND CONCEPTUAL MODELS

2.0 Introduction

This chapter describes the theoretical and conceptual framework adopted in this study. The theoretical framework provides a rationale for conducting a research study upon which the existence of a research problem is explained. It provided the background that supported this investigation and the need for conducting this study in the context of South Africa. The theoretical framework underpins the conceptual model that provides the structure that guides a research study. The stipulation of a theoretical and conceptual framework clarifies the implicit theory in a more clearly defined manner. A theoretical framework was important for this study as it helped make statements, which were based on assumptions that were relevant to the context, risk factors, and findings. Therefore, findings were interpreted while considering the assumptions stated. The framework also connected the current work to existing literature as no research exists in isolation, providing a guide to develop the hypothesis, and methods adopted for analysis. In the end, having a theory helps the researcher identify the limitations to generalising research findings, and aids in understanding how key findings might be different in varying circumstances.

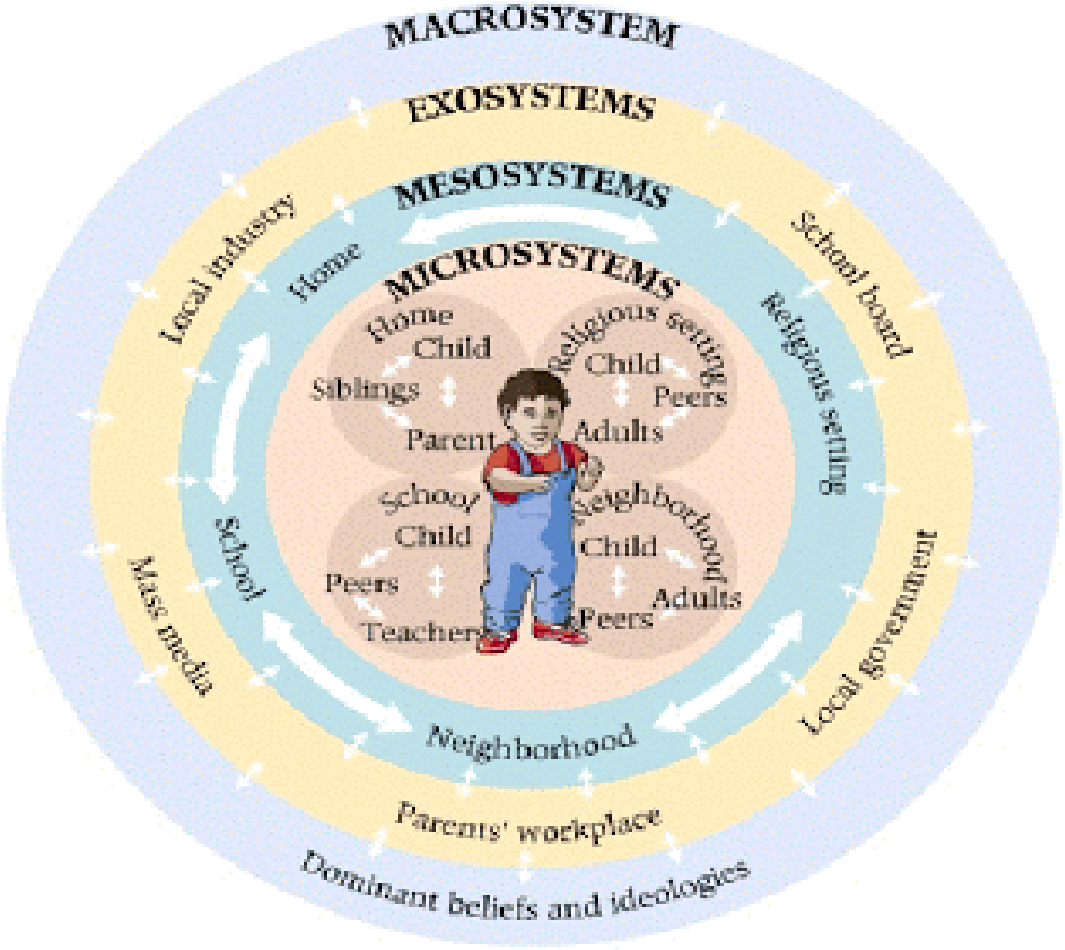
2.1 Theoretical and Conceptual Frameworks

2.1.1 Bronfenbrenner's Ecological Systems Theory

Researchers have previously employed a number of approaches to study factors influencing human development and the contribution of ecological risk factors. Widely used is the Bronfenbrenner's Ecological Systems Theory that looks at a child's development within the

context of the relationships that form his/her context. Bronfenbrenner's theory defines complex systems or 'layers' of environment, each having an effect on a child's development. The theory suggests that interactions between factors in the child's maturing biology, his/her immediate family/community, and the societal landscape fuels and steers their growth (Bronfenbrenner, 1979, 1986, 1988). Changes or conflict in any one layer will affect other layers, and therefore to study a child's development, we must look not only at the child and the immediate context but also interactions at the larger environment as well.

Figure 1: Extract from Bronfenbrenner's structure of the environment in which child development occurs (https://sites.google.com/site/newteacherresources510/home/the-self-social-and-moral-development-of-student)



A brief overview of the Bronfenbrenner's structure of environment shows that the system has four layers; the Microsystem, Mesosystem, Exosystem, and Macrosystem layers as indicated on Figure 1. According to Bronfenbrenner (1979), in order to understand human development, one must consider the entire ecological system in which growth occurs. In his work, he conceived that the ecological environment is made up of a set of nested structures. Within this structure are four layers arranged from the closest to the farthest on impacting an individual: namely the microsystem, mesosystem, exosystem, and macrosystem (Bronfenbrenner, 1979). These systems all have the ability to directly or indirectly influence an individual's development, and a change in one system would cause changes throughout other systems. He argued that multiple risk factors may co-occur across multiple domains and accumulate their effect with implications for outcomes.

The microsystem is the layer closest to the child and contains the structures with which the child has direct contact. The microsystem encompasses the relationships and interactions a child has with her immediate surroundings. These structures may include family, school, neighbourhood, or childcare contexts. At this level, relationships have impact in two directions. For example, a child's parents may affect his beliefs and behaviour, while also the child may influence the behaviour and beliefs of the parent. The mesosystem layer provides the connection between the child's microsystem structures, for example, the connection between the child's teacher and his parents, and between his church and his neighbourhood.

The exosystem layer defines the larger social system in which the child does not function directly. The structure in this layer impacts on the child's development by interacting with some structures in her microsystem. Examples here may include parent's workplace schedules, or community based family resources. The child is never directly involved at this level, but they

feel the negative or positive impact of this layer interaction with his own system. The macrosystem layer is considered the outermost layer in the child's development. While not being a specific framework, this layer comprises of cultural values, systems, customs, and laws. The effect principles defined by the macrosystem have a cascading influence throughout the interactions of all other layers. The chronosystem encompasses the aspect of time as it relates to a child's development.

Modern child development theories accept that both the child's biology and its context play an important role in change and growth. However, the specific role and the extent to which each layer of the environment contributes to the development remains an area of concern and focus. Another challenge to the development theories is the effect of technology on changing societies, shifting economies from an industrial model to that of technological model. Technology has enabled workers to be free from manual labour, that frees time and place boundary. Bronfenbrenner cites the instability and unpredictability of family life as dictated by aspects of economy as the greatest threat to development theories. This study adopts the ecological systems framework proposed by Bronfenbrenner (1994), that is described as encompassing a body of theory and research concerned with the processes and conditions that govern the lifelong course of human development (Bronfenbrenner, 1994).

A review of the literature shows that the ecological systems framework was to predict a variety of early developmental outcomes such as cognitive performance, mental health, physical health, social development, and academic achievement. Small (1994) examined the relationship between adolescent sexual intercourse and several risk factors at the individual, familial and community level and found important risk factors acting within levels of ecology to be important predictors of adolescent sexual behaviours (Small & Luster, 1994). Community level factors were as the

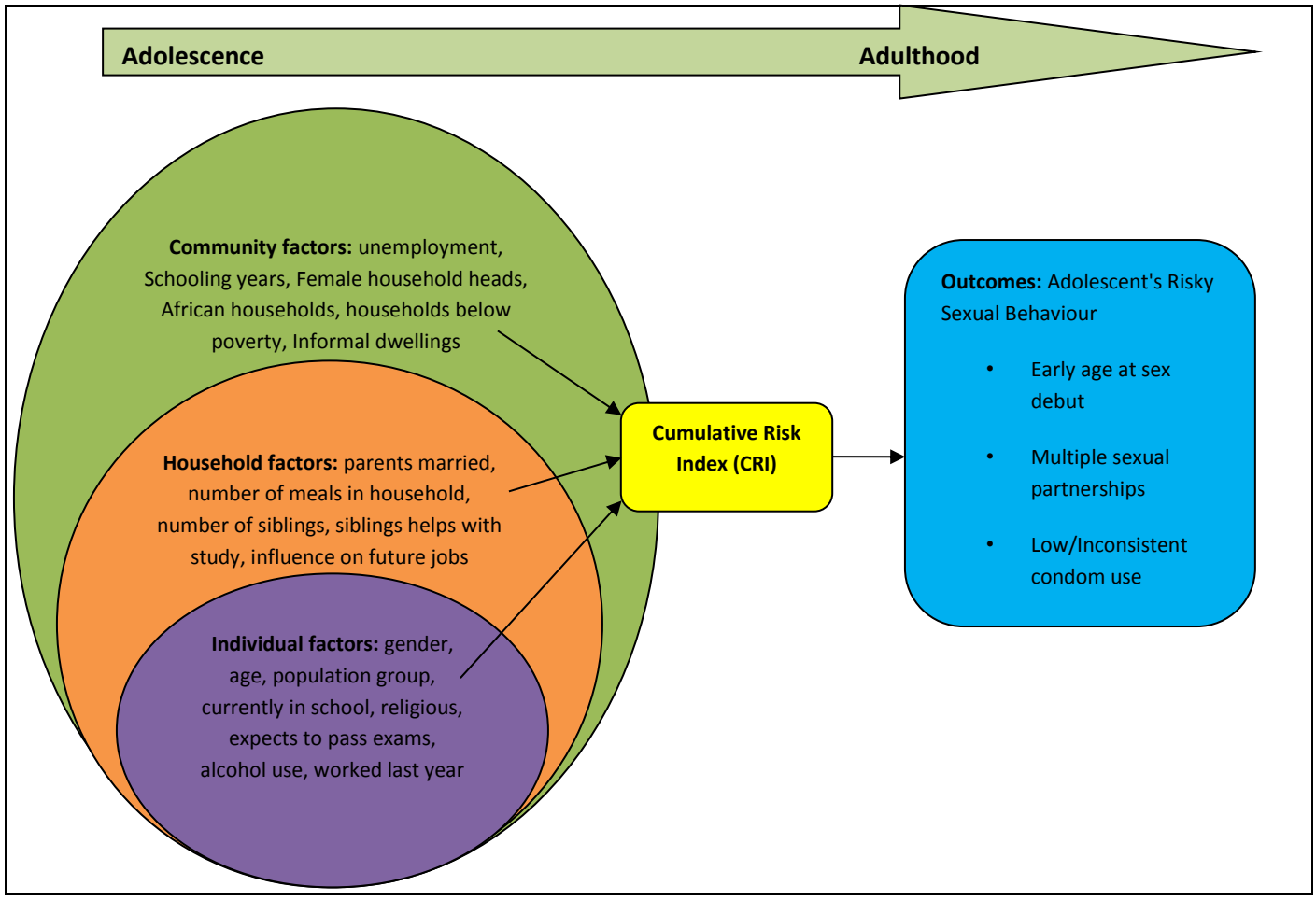
neighbourhood where the respondent grows up, that has the potential to influence the outcomes of risky sexual behaviours, investigated in this study. Studies using the ecological framework to study risk factors for sexual behaviours have mainly reported form the settings of developed countries (Baral, Logie, Grosso, Wirtz, & Beyrer, 2013). Only a handful of studies reporting on community influences on sexual behaviours among young people have reported from sub-Saharan Africa. For example, Stephenson (2009) reported on community influences on young people's sexual behaviour in the three African countries of Burkina Faso, Ghana and Zambia (Stephenson, 2009). He provides strong evidence that community profiles were influential in shaping the behaviours of young men and recommends community level interventions for behavioural change. However, no attempt to integrate factors at the individual, household, and community level into a cumulative approach has been reported to-date in sub-Saharan Africa.

In South Africa, ecological factors have been reported in studies of drug use among adolescents, where individual, household and community level factors have been studied (J. S. Brook, Morojele, Pahl, & Brook, 2006). Although a number of studies have reported on the role of community characteristics including household level socio-economic status on trends of sexual activity (Burgard & Lee-Rife, 2009; L. Eaton et al., 2003), sexual initiation, child bearing (Gage & Meekers, 1994; Manzini, 2001), and teenage child bearing among adolescents (Branson, Ardington, & Leibbrandt, 2011), no research to date has adopted an ecological framework approach to organise risk factors into individual, household, and community levels.

In child development, an ecological framework has been considered as a superior approach, by integrating risk factors occurring at multiple levels of the ecology. Small et al (1994) applied this approach to study adolescent sexual activity in the United States (Small & Luster, 1994). The argument is that risks may be present within the young person's themselves or exist in the

settings in which the they commonly interact with such as the family, household, school, peer group, neighbourhood, and the community as shown on Figure 2.

Figure 2: An adopted theoretical structure & conceptual framework for ecological risk factors



Adopted Ecological Systems Framework and Cumulative Risk Approach, Bronfenbrenner and Small & Luster 1994.

The conceptual model (Figure 2) provides the basic relationship between individual, household, and community factors and outcomes of risky sexual behaviours among adolescents and young adults. The ecological framework perspective proposes that an adolescent's individual context is a major driver of their influence that is mediated by their interaction with family and community.

Studies from developed countries have applied the theory of ecological systems to study various aspects of development in children and youths (Evans et al., 2013; Kuo, Lin, & Li, 2012; Viner et al., 2012). However, ecological systems aspect has not been well described in the context of South Africa especially in areas of risky sexual behaviours.

2.1.1 Cumulative Risk Factor Approach

Human development models on ecological course paradigms emphasises the idea that multiple risks may exist at multiple levels of the ecology and accumulate over time in populations with serious implications for development outcomes. Werner and Smith (1982) defined risk factors as individual or ecological variables that increase an individual's vulnerability to negative developmental outcomes. Risk factors could be fixed at birth (such as race and gender), or could be acquired through the immediate environment (such as exposure to alcohol).

Taken in this context of adolescent sexual behaviours, the basic premise of the cumulative risk factor approach is that an adolescent's decision to engage in sexual activity is not the result of one distinct factor, but a number of factors taken together (Evans, 2004). This approach suggests that there are not only multiple risk factors related to adolescents' sexual activity, but that these factors exist at multiple levels and their effect tends to be cumulative. The cumulative risk factor approach further argues that often sexual behaviours have multiple causes and efforts to find a single cause may not be fruitful. The presence of risk factors does not guarantee the occurrence of a negative outcome but increases the probability of its occurrence as the effect of additional risk factors tends to be cumulative (Bronfenbrenner & Morris, 1998; Small & Luster, 1994).

The works of Day (1992), and Udry and Billy (1987) proposed a cumulative risk index approach where, using a multiple of fixed or acquired factors, risk profiles were generated and used to

identify vulnerable members of the youth,, based on whom prevention intervention strategies were to be focused. Small and Luster (1994) used a cumulative risk approach to integrate risk factors at individual, household, and community level in an ecological framework for understanding why some teenagers in the United States were sexually active while others were not (Small & Luster, 1994). Taken together, these studies provide empirical support for the continued use of a cumulative risk factor approach in an ecological framework to predict developmental outcomes of sexual behaviours. Adopting a cumulative risk approach is especially timely for sub-Saharan Africa where no single study has employed this method to date. This is despite the high prevalence of risky sexual behaviours that demand different approaches to understand their dynamics among adolescents and young adults.

The advantage of the risk factor approach is the simplicity of its application; the predictor becomes the number of risk factors present in the adolescent's life. Furthermore, approach to data analysis is procedural, unlike in models that have empirical methods such as factor analysis that may exclude important risk factors. However, the major disadvantages of this model are that information may be lost when continuous variables are categorized into distinct binary groups. In addition, each risk factor is equally weighted implying that exposure to additional risk factor corresponds to an equivalent increase in the risk of outcome occurring. The researcher hypothesises that adolescent sexual behaviours are determined by an increasing function of the number of risk factors to which they are exposed. Integrating a risk factor approach in an ecological framework, this study suggests that many risk factors exist, occurring at different ecological levels, and that these act cumulatively to influence adolescents sexual behaviours.

2.2 Research Hypotheses

To achieve the objectives of this study, the following hypotheses were tested:

1. Community socio-economic status of income, household heads in employment, sexual behaviour permissiveness, religiosity, and education levels of households determine outcomes of risky sexual behaviours among adolescents and young adults.
2. Household characteristics of parental marital status, relationships with siblings, household income, and socio-economic status determine outcomes of risky sexual behaviours.
3. Significant risk factors at individual, household, and community level of the ecology have a cumulative effect on risky sexual behaviours among adolescents and young adults.

CHAPTER 3: METHODOLOGY

3.0 Introduction

This chapter describes the longitudinal surveys that generated datasets used to inform this research. It describes the Cape Area Panel Study (CAPS), and provides details about the study design, study location, survey instruments, the population, aspects of data management and sample size. The chapter also describes steps in the data analyses by providing a detailed statistical analysis plan used to address study objectives, and the considerations put in place to produce scientifically valid findings from this study. The objective of the CAPS study was to provide a rich detail on transitions made by young people in urban Cape Town, South Africa as they move through life events including: school, labour force, sexual activity, and starting families. Therefore a longitudinal design was preferred, collecting data in five waves, conducted between 2002 and 2009.

3.1 Study Setting

The CAPS study was conducted in the metropolitan area of urban Cape Town in the Western Cape Province of South Africa. The City of Cape Town is the largest metropolitan area in the Western Cape Province, is second most populous city in South Africa after Johannesburg, and is located on the southwest coast of the country. In the most recent population census of 2011, the City of Cape Town had an estimated population of 3,740,025 habitants according to Statistics South Africa 2012 report. The population is made up of Coloured (42.4%), black Africans (38.6%) White (15.7%), Indian/Asian (1.4%), and others (1.9%) (StatsSA, 2013b). Majority of the population are aged between 15 and 64 years at 69.6% of the total city residents. Statistics from Statistics SA indicates that overall unemployment is estimated at 23.9% while youth

unemployment is estimated at 31.9%. The average household size is estimated at 3.3 persons, with piped water penetration estimated at 75%, and electricity connectivity estimated at 94%. Map 1 shows the geography of the study area where enumeration areas for CAPS were sampled from.

Map 1: Cape area in Western Cape, South Africa where CAPS data were collected.



Map downloaded from http://bit.ly/1PeHuiZ

3.2 Survey Design

Data were collected in waves, with the first survey conducted in 2002 where roughly 4,800 young adults aged 14 and 22 years-old were enrolled, and the last wave conducted in 2009. The CAPS sampling plan was designed to produce a household sample that was representative of households in urban Cape Town. It focused on a wide range of issues affecting young adults

including schooling, work, household living arrangements, sexual behaviours and reproductive health. In addition, the design was to produce a young adult sample that was representative of the population aged between 14 and 22 years-old in urban Cape Town. The design allowed the drawing of 4 763 young adults from the population for a statistically meaningful inference from the three major populations. A stratified two-stage sample was designed by working backwards from the target group of young adults in the three populations groups. The first stage involved the selection of sample clusters and the second stage the selection of households within each cluster. The 1996 census was used as the basis of the sampling design, with enumeration areas (EAs) used as the sampling unit for the first stage selection.

According to the CAPS team (http://www.caps.uct.ac.za/sample.html), the sample consisted of two overlapping surveys, with one survey sampling young adults aged between 14 and 22 years, while the second survey sampled both households with and households without young adult members. Detailed sampling design of the actual sample is described in a technical document by the CAPS team. The household sample was drawn as a two stage process; first selecting areas of Cape Town and using enumeration areas from the 1996 Census divided into three strata by defining an area as predominantly African, Coloured, or White. Enumeration Areas (EAs) with less than 25 households were combined with close EAs, to form a primary sampling unit (PSUs) with a minimum of 25 households. Selection of PSUs was done within each stratum with probability that was proportional to the size of the PSU. More details on the survey and sampling procedures have been documented in the Technical Documentation for the Wave 1 (2002) to Wave 5 (2009) survey available through http://www.caps.uct.ac.za/papers/caps_technicaldoc.pdf link.

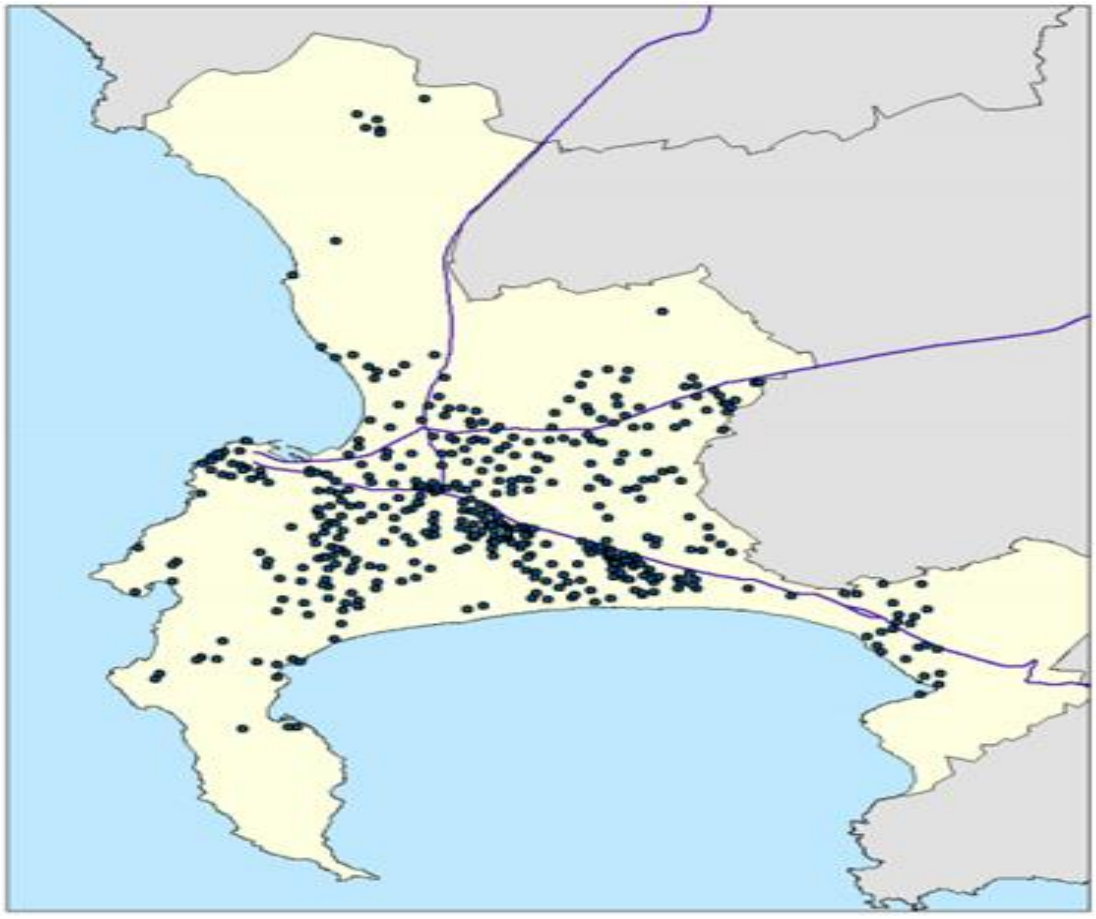
Since the 2001 census data were not available at the time of designing the CAPS survey, the 1996 census was used as the basis of sampling. Metropolitan Cape Town included 4,579 populated Enumeration Areas (EAs) as defined in 1996. In the 1996 census data, the population of Cape Town constituted 26% African, 50% Coloured, 1.5% Indian, and 22% White. In the 2001 population census, the Cape Town population consisted of 32% African, 48% Coloured, 1.5% Indian, and 19% White. Since the Coloured population in the 1996 census was roughly twice the African and White populations, obtaining equal sample sizes for African and Coloured populations implied selecting African households with about twice the probability of Coloured households. Again, it was estimated that White households were less likely to contain young adults; White households too had to be oversampled. The probability of selection was high in African and White areas compared to Coloured areas, to facilitate an equal number of African and Coloured respondents, and about half as many White respondents.

The second stage of the design involved selecting households within the selected sampling units. Aerial photographs were used to draw a sample of 25 screener households that were validated by on-site inspection and updating. This is because it was difficult to establish which households contained young adults, and the screener households were expected to produce the target number of adults aged 14-22 years.

Informal settlements such as backyard shacks on the same property were included with the screened households and added to the sample. All screened households with members aged 14-22 years were selected into the final sample of households to be interviewed. A maximum of three young adults were selected for the young adults sample from each household that had any young adults. In places where more than three young adults were found in each household, the three with the most recent birthdays were selected. The CAPS survey design produces a

representative sample that was not biased to any of the key populations, geographical locations, and socio-economic status. All regions in Cape Town were eligible to take part in the survey with 400 neighbourhoods selected where about 25 households were then randomly selected from each of these neighbourhoods. Eligible participants were then selected from these households. The CAPS study was designed to explore the lives of the young participants had changed over time. The number of enumeration areas for CAPS was 440 and distributed as shown on map 2.

Map 2: Enumeration areas (EA) of the Cape Area Panel Survey study



Map downloaded from http://bit.ly/1LV1dAk

The data were collected in five waves of surveys between 2002 and 2009. Wave 1 was conducted in 2002 and interviewed 4, 752 adolescents and young adults. Wave 2 was conducted

over two years, in 2003 where a third of the young adult respondents were interviewed, and the rest in 2004. Wave 3 was conducted in 2005 and sought to interview all respondents interviewed during the first survey. Wave 4 was conducted partly in 2006 and 2007 seeking to trace respondents from the first survey who had moved out of Cape Town. Wave 5 was conducted in 2009 and sought to interview all respondents with questions on their political opinions following the national election in 2009.

In summary, the CAPS study consist of five waves of data collection, where adolescents and young adults interviewed during the first survey were followed-up with questionnaires, to update on new information. The study design is longitudinal in nature, and provides a rich source of information for researchers and analysts. Important indicators of change in sexual behaviour over the follow-up time were adequately reported: including smoking patterns, sexual risk behaviours, employment, education achievements, and remuneration for work done. This design is not without limitation as the long waiting period between follow-up resulted in significant non-response rates, especially among White respondents. This may present non-response bias especially if the non-responding population was significantly different from the responders.

3.2.1 Wave 1 Sample Design

The Wave 1 sampling design was executed with specific goals in mind, including:

1. The design would produce a household sample that when adequately weighted would produce a representative sample of the households in the urban Cape Town area.
2. The young adult sample would be representative of the population aged 14-22 years in the urban Cape Town area.

3. The sample of young adults would be in the range of 4500-5000 young adult respondents to enable sufficient statistical power to make inferences out of the sample findings.
4. The sample should produce large enough samples of young adults from each population group to make statistical inferences for each of the major population groups sampled. The sample targeted equal numbers for Coloureds and Blacks, and about half of this size from the White population.
5. The design would take advantage of census information to maximise statistical precision and realities of fieldwork operations.
6. The sample should select multiple young adults from a household with a set number of maximum young adults to avoid excessively burdening the household and limited available on field resources.

3.2.2 Wave 2a and 2b Young Adult Sample

During Wave 2, the main aim was interview about one-third of the initial sample in 2003 (Wave 2a) and the remaining two-thirds in 2004 (Wave 2b).

1. For areas predominantly classified as African, every second enumeration area was selected between Gugulethu and Macassar.
2. For EA predominantly classified as Coloured, every third enumerator was selected.
3. Every third White was selected regardless of the EA.

3.2.3 Wave 3 and 4 Young Adult Sample

The target for Wave 3 and 4 was to interview the full set of 4 752 young adults sample responding to Wave 1 of the survey excluding those with mental illnesses or confirmed deceased.

3.2.4 Wave 5 Young Adults Sample

The aim for Wave 5 of the survey was to interview all respondents from any of the Waves 2,3,4, and 5 surveys which was targeted at 4 100 young adults. All African respondents in Wave 5 were asked to provide a blood sample for HIV testing. Coloured and White respondents did not provide blood samples as the number projected to be HIV positive was too small for any meaningful analysis.

3.3 The Population and Sample

There were 22,631 individual records in the household file of Wave 1 survey representing individual household members from 5,256 households selected for enumeration. Since only one eligible respondent aged between 14 and 22 per household could participate in the adolescent survey, Wave 1 survey collected data from 4,752 young adults aged in 2002. The sampled population came from 5,256 households because not all households had eligible participants..

A third of the youth sample was re-interviewed in 2003 (Wave 2a) and the remaining two-thirds were revisited in 2004 (Wave 2b). The available full youth sample were again re-interviewed in both 2005 (Wave 3) and 2006 (Wave 4). Wave 5 was conducted in 2009 with the sample comprising all respondents interviewed in any of the Waves 2a, 2b, 3, or 4. The population sample composition of Wave 1, using a self-classification of the population group by young adults, consisted of 2,144 Africans, 1,976 Coloureds, and 593 Whites.

For this study, data from the five waves of the survey were used to construct the analytical datasets. Baseline characteristics were identified as variables from the Wave 1 survey, while the outcome variables were updated longitudinally, over the five waves of the survey. In the first

wave of the survey of 2002, data from 4,752 respondents were used to construct the outcome, and inform baseline variables. Of these respondents, 2,140 were males while 2,612 were females coming from the three major population groups of African, Coloured, and White.

For the Wave 2a and 2b surveys conducted between 2003 and 2004, a total of 3,927 young adults, roughly 82% of the original sample, completed the survey, and were included in this analysis. A number of young adults did not complete the survey; 313 (7%) of the original sample were not available, while about 213 (5%) had moved within South Africa, and 142 (3%) refused to respond. In the Wave 3 survey conducted in 2005, a total of 3,531 young adults responded to the survey, forming about 74% of the original sample. These were included in the analyses by building on their sexual experiences in the preceding surveys and were used in defining the longitudinal aspect of the outcome of interest. The majority of the non-responses were attributable to movement within South Africa, with about 532 (11%) having moved in the time period since the first survey.

In the Wave 4 (2006) survey, a total of 3,439 young adults completed the survey. A number of young adults did not complete the survey because; 590 (12%) had moved from their first residence, and 304 (6%) refused to respond. For the Wave 5 (2009), a total of 2,915 young adults completed the survey, while the majority of those not responding had either moved or refused to respond during the field visit. The data for all these surveys were used to define both the outcomes and the independent variables and informed on the longitudinal nature of this study.

3.4 The Instruments

The CAPS questionnaires were developed in 2001 and 2002 through deliberations between the University of Cape Town (UCT) and the University of Michigan (UM). Questions were

extracted from previous studies conducted in both South Africa and the United State, and other countries that had conducted related studies were also consulted. The questionnaire was then tested in small groups, and also with pilot studies conducted in May and June. The questionnaires were administered as a face-to-face in-home interview using a paper questionnaire. The young adult and household questionnaires were administered in English, but the interviewer had options for Xhosa and Afrikaans translation where necessary, while the literacy/numeracy questionnaire was completed by the young adult. Three set of questionnaires were administered; a young adult, a household, and a young adult literacy/numeracy evaluation questionnaire.

3.4.1 Young Adult Questionnaire

The questionnaire was administered to each of the three selected household members aged 14-22 years in households that were randomly selected to participate. As aforementioned, where more than three household members were eligible, the three with the most recent date of births were asked to complete the questionnaire. For individuals under 18 years, consent from both the parent and the young adult, were sought for them to be interviewed. The young adult (YA) questionnaire contained a number of modules and these were discussed here:

a. Background characteristics

The YA questionnaire collected information on basic demographic characteristics that included age, ethnicity, place of birth, main language, and religious affiliations.

b. Life history calendar

The life calendar was a major area of focus of the young adult questionnaire. This made it easier for interviewers to capture relevant data in a logical way. The calendar reported on aspects of living arrangements and relationships. Another part of the module focuses on school and work.

c. Schooling

This module collected information on current and previous schooling activities.

d. Employment

The young adult's labour force activities were collected using this module, including information on job searches, for up to three recent jobs. In addition, this module adds information on multiple jobs, and spells of job searches.

e. Health and fertility

This module collected information on health indicators, sexual activity, fertility and child bearing, and a number of questions related to HIV/AIDS. All these data were collected through responses, and no specimen or measurements were taken during the interview. Part of the questionnaire regarding sensitive information could be completed by the respondent if they were not comfortable discussing the information.

f. Non-resident biological parents

This module collected data on the biological parents of the young respondent. The main focus however was on information regarding parents not residing with the respondent.

g. Grandparents

Information on the two pairs of grandparents were collected. This included age, receipt of government support in terms of pension, and their location.

h. Parental investment

This module reported on the extent of parental involvement in the wellbeing of the young adult. Related information was collected for involvement of biological parents, stepparents and other guardians. This collected data on how parents and guardians spent time with the young adult.

i. Childhood and family context

The module collected data on the family context in which the young adult grew up. It covered aspects of parent employment, education levels, and how they relate to the young adult. It also reported on data regarding the influence of other household members, and whether there was any aspect of drug abuse.

j. Time allocation and social involvement

This module reviewed questions of time in hours spent in the past week doing activities such as a paid job, attending school, and caring for adults or children. It also reviewed aspects of social activities including sports and religious activity.

k. Contact information

This module reported information on people who could be reached to help locate the young respondent to participate in successive waves of the surveys.

3.4.2 Household Questionnaire

When a household was selected for the sample, a person in the household was selected to complete the household questionnaire. It was required that the household respondent be over 18 years, and most knowledgeable about everyone in the household. The household questionnaire consisted of the following modules:

a. Roster of household members

This had a listing of all household members who lived within the compound, defined as spending 15 of the previous 30 days there. Demographic variables such as age, schooling, immigration, employment status and remuneration were collected. This roster was used as the basis for selecting young adult respondents by identifying members aged between 14-22 years.

b. Roster of non-resident children

Once the household roster is complete, a list was collected of all biological children of household members aged between 0-22 years, not living in the household. Demographic variables including age, schooling, employment status, and location were collected.

c. Household Events

Events that had affected the family in the previous 24 months were recorded. These included deaths, serious illnesses, loss of employment, and break-up of marriage.

d. Household Characteristics

This module collected data on the characteristics of the household including the dwelling type, availability of water and electricity, and ownership of consumer durables.

3.4.3 Literacy and Numeracy Evaluation

Each of the young adults completed a questionnaire on literacy and numeracy evaluation. The items of the evaluation were developed in collaboration with the Joint Education Trust, and took about 20 minutes to be completed.

3.4.4 Data Processing

CAPS data from the five waves of the survey were available to researchers and policy makers in the public domain. Data were accessed through DataFirst, a research data service, dedicated to making South African and other African surveys available to researchers. The available data have been cleaned, merged, and stored in several formats available from the online portal. The CAPS data formats were released online in Stata, SPSS, and Systat formats. The Stata format of these publicly available CAPS datasets were downloaded and analysed for this study. The Stata version of the CAPS data was downloaded to prepare analytical datasets. The final dataset used had all variables for the various waves of the surveys merged by the CAPS data team.

3.5 Variable Identification

CAPS cover a range of aspects of adolescence and young adulthood, including schooling, entry into the labour market, sexual and reproductive health, and experiences within families and households. Outcome variables from Wave 1 (2002) to Wave 5 (2009) datasets were selected, and analysed longitudinally to examine trends and levels of risky sexual behaviours. The longitudinal datasets provided a platform to study determinants of risky sexual behaviours when risk factors appear at the three levels of the ecology including individual, household, and community level.

3.5.1 Dependent variables

This study investigated transitions in sexual activities defined for three outcomes including early age at sexual initiation, consistency in condom use, and multiple sexual partnerships among adolescents and young adults.

Dependent variables were created as binary responses that were true if respondent reported the risky sexual behaviour during the follow-up. For instance, for early age at sexual debut, this outcome was true for a respondent reporting sexual activity before the age of 15 years for a sample of those who were sexually inexperienced at Wave 1 (2002) survey. It was false if the respondent had been sexually active before the baseline survey or had sexual activity after 15 years of age. Adolescents and young adults reporting sexual activity at baseline were excluded regardless of their follow-up outcome. Excluding respondents with previous sexual experience before the baseline survey was crucial to attribute any sexual transitions during follow-up to only attributes measured during the baseline survey.

For multiple sexual partnerships, the outcome was true for those reporting two or more sexual partners in the last year after the baseline survey, and false if only reporting a single partner during the period under consideration. This also excluded any respondents reporting multiple sexual partnerships at the baseline survey, as factors attributed to transitioning into multiple sexual could not be measured before Wave 1 (2002) baseline survey. For consistency in the use of condoms, the outcome variable was true if the adolescent did not use condoms consistently in the follow-up period, and it was false if the condoms were consistently used. For both multiple sexual partnerships and consistency in condom use, the definition of outcomes was true if the risky sexual behaviour exposed adolescents to negative outcomes, such as having more than one

sexual partners and not consistently using condoms. These definitions have been considered in the findings and interpretation of results.

3.5.1.1 Early age at sexual debut

Early sexual intercourse was defined as experiencing penetrative sex before the age of 15 years during the follow-up period. At Wave 1 survey, respondents were asked whether they had engaged in penetrative sexual activity, and their responses used to create a sample for follow-up. Respondents reporting sexual activity at baseline were excluded from further investigations. Adolescents and young adults who reported no sexual activity at baseline were then followed-up for transition where the sample was further restricted to those aged less than 15 years. The final response was a binary outcome that was 'yes' if the respondent had sex or 'no' if the respondent had no sexual experience by age 15 years. The basis of the analyses was to compare those who had no sexual experience at the start of the surveys, and transitioned into sexual activity before the age of 15 years, to their counterparts with no sexual activity during this follow-up period.

3.5.1.2 Consistency in the use of condoms

Consistency in the use of condoms was self-reported by respondents taking part in the survey where condom use at last sex was probed. Respondents could either respond to 'always', 'usually', 'sometimes', or 'rarely'. Consistency in condom use was defined as always using condoms for sexually active respondents from baseline to follow-up surveys. Respondents who were not sexually active at baseline were excluded, and those that were sexually active at baseline were probed on whether they had always used condoms during the last sexual activity. Respondents not always using condoms at baseline were excluded from further follow-up, while

the analyses sample was followed-up to assess transitions out of 'always' using condoms category.

3.5.1.3 Multiple sexual partnerships

At baseline, the analyses sample was restricted to respondents who were sexually active and only reporting one sexual partner. Indicators of multiple sexual partnerships were assigned to respondents who reported having two or more sexual partners in the last 12 months of the follow-up surveys. The binary outcome was 'yes' for those reporting two or more sexual partnerships during the previous year at any survey period of follow-up, and was 'no' for those reporting one partner.

Table 1: Defining dependent variables

Outcome variables	Definition	Males	Females
Early age at sexual debut	Reported sexual activity at age 15 or below after the baseline survey	0 if not reporting early age at first sex 1 if reporting early age at first sex	0 if not reporting early age at first sex 1 if reporting early age at first sex
Consistency in the use of condoms with last sexual partner.	Reported usually using condoms with the last sexual partner after the baseline survey	0 if reporting consistency 1 if not reporting consistency	0 if reporting consistency 1 if not reporting consistency
Multiple sexual partnerships in last 12 months	Reporting more than one sexual partnership in the last year	0 if not reporting 1 if reporting MSP	0 if not reporting 1 if reporting MSP

The dependent variables were constructed over the follow-up period for the capture of sexual transitions across the waves of the surveys. The outcomes were constructed to emulate a case-control study where outcomes are considered at the end of follow-up. Finally, the outcomes assumed the following values: early sexual initiation (0=Not sexually experienced at an early

age, 1 = sexually experienced at an early age), multiple sexual partnerships (0= Not reported MSP, 1 = Yes Reported MSP), and condom use at last sex (0=Yes used, 1 = Not used).

Ideally, using a time-to-event analysis would be the preferred analytical approach, but a lack of time-to-event data that includes the estimated time of occurrence of the outcome made this analytical approach impractical. The potential effect of attrition or loss to follow-up would bear a significant influence on results reported if time-to-event analysis were conducted. However, this study has adopted an analysis based on the intention to treat, using a retrospective case-control definition, to assign outcomes based on information in all five waves of the survey. As such, the effect of attrition, and loss to follow-up had minimal effect on the baseline comparison between cases reporting the outcome and controls.

3.5.2 Independent variables

An independent variable is a factor that can directly or indirectly determine the outcome of interest, a factor that can influence reports of risky sexual behaviours among respondents. In the context of risky sexual behaviours, risk factors were defined to imply characteristics that were associated with reporting a sexual behaviour that was considered risky, such as having unprotected sex, having multiple partnerships in the same year, and starting sexual activity early. Risk factors can be fixed at birth (such as sex and race), or acquired through the environment which an individual is exposed to, including family, and neighbourhood.

Previous studies reporting on the social context of risky sexual behaviour among adolescents and young adults were reviewed while selecting relevant independent variables (Small & Luster, 1994). These variables were organised according to the conceptual framework adopted and were tested on the outcomes as per the analytical framework. Independent variables were first

included in a univariate model with a preselected level of significance where all significant factors were then included in a final multivariable model. The Kotchik et al (2001) multi-system perspective of adolescent sexual risky behaviour reports on a number of risk factors associated with adolescent risk taking where factors from the self, familial, and extra-familial systems are reviewed for related papers (Kotchick, Shaffer, Forehand, & Miller, 2001). Other literature reports on the influence of socio demographic characteristics on adolescent risky sexual behaviours reviewing the tribe, and primary caregivers of the adolescents (Oluwatoyin, 2014). Brooks-Gunn et al (1989) reviewed previous literature on the known causes of adolescent sexual activity, factoring gender and ethnic differences. The authors also considered possible biological, social, and social cognitive processes underlying teenage sexual behaviours (Brooks-Gunn & Furstenberg, 1989; Brooks-Gunn & Warren, 1989).

Informed by literature, risk factors occurring at the individual, household, and community levels were selected and investigated against outcomes. At the individual level, factors identified included population group (Black African, Coloured, Indian, White, or others), school attitudes (positive or negative), achievements and aspirations, type of school (private or public) the respondent was attending at the time of the survey, highest level of education achieved (reported in years of schooling), and their views on passing matric exams (pass or fail on first attempt). In South Africa, matriculation (also referred as matric) is term used to refer to the final year of high school that precedes formal entry into a university study, and may imply university entry level exams in the context of other countries. Present relationships of the adolescent or young adult were assessed by looking at duration of first sexual relationship (measured in months in relationship), age of first sexual partner (reported in years), and whether first sex contact was forced or consensual.

Table 2: Defining independent variables

Individual level variables	**Household level variables**	**Community level variables**
Male sex **(*Male/Female*)**	Number of siblings **(count)**	% HH Unemployed
Age **(*Years*)**	Parents married ***(yes/no)***	% HH female headed
Population Group ***(Black/Coloured/White)***	Mother spend time with YA ***(yes/no)***	%HH Informal dwelling
Years of Education **(*Years*)**	Father spends time with YA *(yes/no)*	% HH Africans
Enrolled in school **(*yes/no*)**	Mother a HH member ***(yes/no)***	Mean schooling years
Expects to pass Matric **(*yes/no*)**	Father a HH member ***(yes/no)***	% HH below Poverty
Worked in last 12 months ***(yes/no)***	Siblings help with study ***(yes/no)***	
Expects to work in 3 years ***(yes/no)***	Number of HH meals in a day **(count)**	
Age of first sex partner ***(years)***	Influence of potential future job	
Religious ***(yes/no)***		
Age at first sex **(years)**		
Knows someone with HIV ***(yes/no)***		
Knows someone died of HIV ***(yes/no)***		
Likely work in three years ***(yes/no)***		
Marry in three years ***(yes/no)***		
Alcohol use ***(yes/no)***		

Employment in the last year was assessed by looking at working history (employed or unemployed in last year) and whether the work was gainful (paid or voluntary), and their expectations of finding gainful employment in the coming years. In addition, knowledge of HIV transmission (knowledge scores), knowing someone living with HIV and knowing someone that died of HIV, were investigated for their influence on outcomes.

At the household level, family socio-economic status was assessed by looking at the employment status of either or both parents (employed or unemployed), education status of mother and father (years of schooling), household incomes (reported in ZAR), and availability of meals in the household (number of meals in a day). Parental supervision and monitoring was assessed by using variables of respondent's interactions with parent, whether they were living with single or both parents, either of the parents discussed personal matters with the adolescent, and whether

parents were married to each other. Closeness to the parents was assessed by looking at how often adolescents and young adults ate meals with their father or mother.

At the community level, factors investigated include mean age at marriage, community monitoring, and attitudes towards adolescent sexual activity. In addition, the socio-economic profile of the community was computed by assessing proportions of men and women in employment, status of household heads schooling in the community (percentage of men or women with matric and above), and availability of health and social amenities within the community. Furthermore, knowledge of people living with HIV, knowledge of people having died from AIDS, and community religiosity (percentage affiliated to religion), were investigated. Table 2 reports on selected independent variables organised according to the levels of the ecology per the individual, household, and community levels.

3.6 Steps in Data Analysis

3.6.1 Descriptive Statistics

Using the adolescent questionnaire for Wave 1 (2002) to Wave 5 (2009), adolescent sexual behaviours were described, for early age at sex initiation, multiple sexual partnerships, and condom use. Early age at sexual initiation was defined as sexual intercourse before the age of 15 years. Description of multiple sexual partnerships involved having more than one sexual partner in the last year, whether the partnerships were concurrent or not. Consistency in the use of condoms was described for young adults as either using or not using condoms during last sexual intercourse.

Firstly, levels of the three sexual risky behaviours considered here were determined, across the five waves of surveys whenever related data were reported. Secondly, characteristics of young adults reporting early sexual debut, multiple sexual partners, and inconsistency in the use of condoms were compared against young adults not reporting these sexual risky behaviours. This gave insight into differences between the two groups and helped to inform findings of this study. Important characteristics here were pointers to variables and factors that were investigated in the univariate and multivariate models.

The frequency and proportions of adolescents and young adults reporting risky sexual behaviours between Wave 1 and Wave 5 were described. Trends in the time period between 2002 and 2009 were described as an increment, decrement or stable if the two proportions are similar for 2002 and 2009 survey findings. Analyses were stratified by gender as males and females were expected to have differences in sexual activity as informed by literature reviewed on related adolescent sexual behaviour studies in South Africa and many parts of the world. Findings from a description of the sample are reported in Chapter 4 of this thesis and provide a basic understanding of the underlying sample using descriptive statistics.

3.6.2 Bivariate Associations

It was hypothesised that risky sexual behaviours among adolescents and young adults were influenced by their context of development, a concept that underpinned the theoretical and conceptual frameworks of the study. Therefore, a number of factors at the individual, household and community level were identified for analyses, and investigated against the three binary outcomes of reporting early age at sex debut, multiple sexual partnerships, and condom use among the respondents identified for this study.

Bivariate analyses were conducted to determine associations and correlations between identified dependent and independent variables. Simple chi-square tests were used to test for significance associations between categorical independent variables and the binary outcomes while t-tests were used for testing associations between continuous independent variables and the binary outcome variables. The use of bivariate associations for outcomes informed on factors which be used for univariate and multivariate analysis. Findings from bivariate analysis are reported separately for the three outcomes in the results section.

3.6.3 Multivariate Analysis

Multivariate analyses were conducted using Discriminant Function Analysis (DFA) to identify a linear combination of risk factors that significantly differed between the binary outcome groups. The first step involved using univariate models to identify ecological factors that were statistically significant in explaining the differences in the binary outcome groups. This was repeated for all variables at individual, household, and community level appearing on Table 2. Univariate analysis informed risk factors that were included in multivariate models. The most parsimonious multivariate model was selected to identify a combination of risk factors that accounted for the differences in outcome groups. Risk factors selected in the final model were used in the cumulative risk factor analysis.

3.6.4 Cumulative Risk Index

A cumulative risk index (CRI) was constructed in three ways: (1) by identifying significant risk factors that discriminated against the risky sexual behaviour under study, (2) dichotomising the risk factors and scoring them as either present or absent using defined risk thresholds, and (3) summing the number of risk factors present. Risk profiles were produced for each of the

respondents by creating a multifactorial model that represented the interplay of the risk factors that were significant in the multivariable analysis. These profiles were used to understand vulnerable respondents in society, where prevention messages and programmes could be focused. A cumulative model assumed that it was the accumulation of risk factors across the individual, household, and community levels that contribute to risky sexual behaviours rather than a single factor considered in isolation. As the number of risk factor increases, regardless of the specific risk, sexual behaviours became adversely affected.

CRI models were innovative in nature and had a number of advantages; most importantly, (1) they were sensitive for small datasets and this was important where large sample sizes were unattainable. In addition, (2) the CRI could model multiple and interrelated risk factors parsimoniously, with a simpler presentation because the metric was easy to calculate. Again, (3) the CRI made no assumptions about relative strengths of the factors as every risk factor included contribute a similar level of risk (Evans et al., 2013). Also, (4) the CRI models were compatible with an ecological framework as hierarchy was not important. Lastly, (5) CRI sidestepped the problems of correlation or overlapping of community factors, arising from using regression models. Having correlated factors in a regression model results in deflated parameter estimates, distorting the actual associations between independent and dependent variables.

Using the CRI, a comprehensive measure of social contexts at multiple levels (such as individual, household, and community) was created, from data that were collected over time (including multiple waves of a survey), like the CAPS. It is reported that a cumulative risk index may yield the most complete estimate of overall risk for a young adult in the community. The model also had the capacity to inform the threshold, or the number of risk factors a young adult could be exposed to, for behaviour to predict unsafe outcomes. Literature and online materials

used to inform the creation of risk factors included conceptual approaches, models, and other tools that were relevant for sexual risks posed to adolescents in their growth contexts. Materials exploring the ecological effect on sexual behaviours among young adults were reviewed and risk thresholds were determined from available literature.

However, these CRI models also had a number of limitations; firstly, risk was assigned arbitrarily and sound judgement had to be exercised to determine a threshold beyond which a factor was considered detrimental. This was especially a challenge, more when classifying continuous factors than it was for binary factors. For example, if alcohol consumption was a significant risk factor, literature informed on levels of alcohol use were deemed risky for sexual activity and informed the cut-off point. A statistical cut-off point was generated using the distribution of the continuous variable, adopting the medians or lower and upper quartiles informed by existing literature. For binary variables, conceptual or natural categorization informed the grouping into the presence or absence of risk (such as poverty line to include below or above). Besides, dichotomising continuous data could result in data loss, and interpretation of the findings should be done with moderation.

Secondly, using the CRI assumed that ecological factors at the individual, household, and community levels give a similar contribution to the risk index, contrasting the traditional regression methods where risk factors provide differing contributions to the outcome. Literature reviewed showed that even though each of the individual risk factors has their separate metric of influence, combining these using a cumulative approach provides a more powerful metric than any of the separate risk factors, for assessing the outcomes. In addition, it is unclear how the channels of risk contribute to developing the outcomes of interests, a major limitation while proposing interventions. This is the common approach for epidemiological research where

besides identifying risk factors, the way through which risk factors act to influence the outcomes, are postulated. However, the index was used to identify between high and low risk young adults. Most importantly, the index may inform policymakers about how young adults in the context of identified risk factors pre-dispose them to risky sexual behaviours. Association between increased risk factors and reporting sexual behaviours was assessed using measures of association including the correlation index. It was obvious that a CRI model is an alternative to many approaches that could inform the relationship between risky sexual behaviours and contextual factors, and it was not deemed the only way to analyse such data.

3.7 Statistical Analysis

Data manipulation and statistical analysis were carried out in Stata 13 (StataCorp, 2013). Frequencies, proportions, means and medians were used to summarize data stratified by gender. Identified risk factors were summarized either using means if the factor was continuous or medians if the factor was ordinal, and frequencies were reported for categorical responses, especially as a number of variables had binary responses. For normally distributed variables, the test statistic for differences between outcome groups was conducted using Student's t-distribution, with the level of significance set at $p<0.05$. For categorical variables, differences between the outcome groups were investigated using Chi-square tests, to determine whether differences in expected and observed frequencies were significantly different. Where a response did not follow the normal distribution, non-parametric tests were used to investigate for differences between outcome groups using the medians. The non-parametric Wilcoxon rank sum test was used to investigate whether response groups came from a similar distribution by testing their medians for equality.

The first stage of analysis involved identifying and reviewing independent variables from literature and additional other factors available for this study. Outcomes of risky sexual behaviours were defined using specific responses for age at sexual initiation, multiple sexual partnerships, and condom use as aforementioned. Independent factors were summarized separately for males and females by outcome responses. The second step, involved applying a discriminant function analysis to perform univariate and multivariate analyses between the defined response variables and identified risk factors. This was done separately for males and females as gender differences in risk have been observed in previous research.

A final step involved coding for the cumulative risk analysis where all significant risk factors identified in the multivariate model were coded into a binary indicator (present = 1, absent =0) to represent presence or absence of risk using cut-off points supported by literature. A cumulative risk index (CRI) was constructed for each adolescent by summing present risk factors that were significant in the discriminant analyses. The cumulative risk is then analysed against reports of risky sexual behaviour outcomes, modelled using a linear regression to determine the level of variability in the outcome explained by the cumulative risk index.

3.7.1 Discriminant Function Analyses

Discriminant function analysis (DFA) is a statistical technique used to predict a categorical dependent variable by one or more continuous or binary independent variables. Linear discriminant analysis (LDA) is a generalization of Fisher's linear discriminant developed in 1936 as dichotomous discriminant analysis and was applied to find a linear combination of features which characterised or separated two or more classes of objects. The method is robust, flexible, and easily used, and has meaningful interpretation. The assumptions of the LDA include the

normality of the explanatory variables. LDA was used to determine which variable discriminates between one or more classes, and to derive a classification model for the predicting group membership of new observations.

There are many types of discriminant function analysis, but this study adopts the classical (Fisherian) discriminant analysis that is widely used when the outcome variable has only two groups of classification. The standard LDA model assumes that the conditional distribution of X|y is multivariate normal with mean vector μy and common covariance matrix ∑. The discriminant function, can be shown how a variable x is assigned to a particular group 1 as

$$P(1|x) = 1/(1 + (e^{\alpha+\beta x})$$

Where α and β coefficients are

$$\beta = (\mu_1 - \mu_0)^T \sum^{-1}$$

$$\alpha = -log\ \frac{\pi_1}{\pi_0} + \frac{(\mu_1 + \mu_0)^T \sum^{-1} (\mu_1 - \mu_0)}{2}$$

π_1 and π_0 are the prior probabilities of belonging to group 1 and group 0. In practice, the parameters a $\pi_0, \pi_1, \mu_0,$ and μ_1 will be unknown, and are replaced by sample estimates, i.e

LDA is a dimensionality reduction technique, pattern classification, whose goal is to project a dataset into a lower dimension space, and avoid overfitting of models, especially where many independent variables are investigated. LDA also provides an additional aspect of finding a group of variables that maximise differences between the outcome variables. The resulting

combination expresses one dependent variable as a linear combination of the independent variables by reducing the dimensions before classification. In essence, LDA looks for linear combination of factors that best explains the data, when outcome variables are in sensible binary groupings before defining a better fitting combination. The goal of the LDA is to find the best fitting and most parsimonious model to describe the relationship between the outcome (dependent or response) variables and a set of independent (predictor or explanatory) variables. The multivariate discriminant function analysis involves including several independent variables in an analysis to assess which one(s) contribute to the discrimination between two groups. The results produce a matrix of total variance and covariance, and pooled within-group variances and covariance. When compared, the matrix gives an F-test that determines whether the groups were significantly different. The original LDA defined by Fisher was formulated for a two-class outcome, but was later developed to include more than two outcomes. LDA assumes that each group must come from a population where independent variables are multivariate normally distributed, that data must not have linear dependencies meaning statistical independence and that population covariance must be equal in each group. For the multivariate normal assumption, LDA performs optimally when both continuous and categorical variables are in the model, and the method works best when at least one or more of the predictor variables are continuous. Most importantly, LDA defines the best fitting, or minimum number of dimensions needed to effectively account for differences between two groups (Grimm, 1995; Stevens, 2002).

3.7.2 Comparing Linear Discriminant Function Analysis (LDA) and Logistic Regression

Further, comparing the LDA and logistic regression methods, two of the most commonly used statistical methods for analysing categorical outcome variables against a set of categorical or continuous variables. Logistic regression is related to discriminant analyses in that the response

variable may reflect membership in one of several populations, where the explanatory variables are normally distributed. Both are appropriate for the development of linear classification models as the obtained results are close when underlying assumptions of normality and categorisation are satisfied (Press & Wilson, 1978). However, the LDA gives better results in the case when the normality assumptions are fulfilled. LDA estimates and test statistics afford readily calculated estimates that are easy to interpret compared to other alternative models and in many instances results from these models often agree. The LDA is further preferred when the main purpose of an analysis is to predict group membership, whereas the logistic regression may be more applicable where the aim is to quantify the effect of the explanatory variable on the dependent variable. LDA is also different from Analysis of Variance (ANOVA) and Multivariate Analysis of Variance (MANOVA) as these two techniques were respectively used to predict one or more continuous dependent variables from one or more independent categorical variables. Therefore, if the essence of an analysis is to classify significant risk factors according to an outcome group, the LDA is the preferred model of analysis and was selected for this study. In general, according to Press et al (1978) classifying an observation into one of several populations is the domain of discriminant analysis (Press & Wilson, 1978). Backward Stepwise Discriminant Analyses

In this study, a backward stepwise discriminant analysis approach was applied to select a group of independent variables that best described differences between binary outcome groups. In the first instance, all relevant factors were included in the model, all variables were evaluated and those with little contribution to the group classification were excluded. As a result of backward stepwise analysis, only important variables were kept in the final selected model, including only of those variables that contributed most to the group discrimination. The F-value for each of the resulting scores were evaluated to choose the most parsimonious model resulting from including

or excluding variables in the selection. The most parsimonious model reported a reduced linear combination of independent variables that best characterises or separates binary groups of the outcome variables, for and against reporting outcomes of risky sexual behaviours.

3.7.3 Dealing with Panel Data

The Cape Area Panel Study involved multiple observations of the same adolescents during a follow-up time spanning over seven years. Analysis techniques applied to this study focused on cross-sectional variation of responses across the surveys. These data were captured without time of event indicator, and the study could not adopt a more robust time to event analyses, using the Cox proportional hazards model where outcomes occur over follow-up.

These analyses adopted a case control approach to define the outcome of reporting risky sexual behaviours. At baseline, all respondents identified for follow-up formed the baseline cohort that was included in the analyses, consisting of respondents who had no reports of the outcome of interest. The outcome of interest in this study was experiencing or reporting a risky sexual behaviour under consideration during the follow-up. Cases and controls were defined at the end of follow-up period, where cases were defined as adolescents and young adults reporting any of the risky sexual behaviours under study, while controls remained without experiencing any outcome of interest. Inclusion to the analysis cohort was defined from the baseline survey, to ensure that observed differences in outcomes of risky sexual behaviours, were only because of factors observed at baseline. Therefore, respondents formed a cohort that was followed-up with exposure from indicators that were observed only at baseline, and that observed outcomes could be attributed to the baseline characteristics. This eliminates exposure biases between those experiencing risky sexual behaviours and those not experiencing. This informed whether young

adults reporting an outcome were different with those not reporting outcomes during the time of baseline survey.

Outcome variables were constructed using all five waves of surveys where data were complete and non-missing. The analysis followed a case-control approach, where outcomes of interest were defined at baseline and updated across the surveys, with reference to baseline characteristics. Young adults were followed-up over time, and declared as cases if they experienced outcomes of interest, and non-cases if they had never experienced outcomes. The defined binary outcomes were analysed using the LDA technique to identify factors that discriminated on participants reporting risky sexual behaviours versus those not reporting.

3.8 Ethical Issues

The CAPS project operates under the approval of human subject review boards at both University of Cape Town and University of Michigan. Ethics approval for Wave 4 was granted by the human subject review board at Princeton University. The project team, including staff and interviewers, received training on issues of informed consent and confidentiality of medical reports. These analyses have used the publicly available datasets from CAPS surveys. As such, no application for ethics clearance for this investigation was done, for using ethics approved secondary data sources. Necessary clearances for accessing CAPS datasets were sought, and the guidelines for using data were strictly adhered to in the thesis analyses and submissions to conferences or publications. All papers, and posters using the CAPS surveys for Waves 1-2-3-4-5, cited the Centre for Social Science Research, University of Cape Town. Necessary permissions and clearances to access these datasets had been granted by the centre at the time of analysing these data. Issues of confidentiality for publicly released data from CAPS were

addressed by removing all names, addresses, and contact details, names of schools, names of employers, date of birth and other personal information that might compromise confidentiality. Actual census enumeration areas were never released to the public as the numbers could be linked back to the participants.

CHAPTER 4: BACKGROUND CHARACTERISTICS OF THE SAMPLE

4.0 Introduction

This chapter presents descriptive statistics for variables of socio-economic and demographic characteristics of adolescents and young adults selected for interviews both at baseline and follow-up CAPS surveys. The descriptive analyses help describe and summarize circumstances of study population in a way that identifies patterns that further inform the objectives of the study. This provides a meaningful way of understanding the data and allows making simpler interpretations concerning observed findings. The data were described in graphs, tables, and figures for isolated variables and also cross-tabulations for relationships between two or more variables. Demographic and socio-economic characteristics analyzed were mainly related variables that were relevant to the study topic of risky sexual behaviours.

Measures of central tendency, which describes the central position of a frequency distribution of responses, were used to describe the sample. A number of ways were used to describe the distribution of responses including the mean, median, and mode of the distribution. The median observation was reported together with the lower and upper interquartile range to indicate the spread of the responses. The mean of the distribution was reported with the standard deviation to indicate the spread of the distribution from the mean. Group data were summarized using tables with frequencies and cross-tabulations, graphical description using graphs and a variety of charts, and a brief discussion of the results to give possible significance. However, descriptive statistics had a limitation in that meaningful conclusions could not be drawn, beyond the analyzed data.

For each Wave of the survey, descriptive statistics were provided, and form the basis of comparison with subsequent years. These yearly levels, when observed over time, provided a

trend analysis, which was modelled to project future levels. Analyses were done separately for males and females as previous research indicate that behavioural characteristics differ by gender.

4.1 Socio-economic and Demographic Characteristics

Table 3 indicates the socio-economic and demographic characteristics of adolescents and young adults responding to the five rounds of survey.

Table 3: Socio-demographic characteristics of the young adult respondents

Socio-demographic variables	**Wave 1 (2002)**	**Wave 2 a/b (2003/2004)**	**Wave 3 (2005)**	**Wave 4 (2006)**	**Wave 5 (2009/2010)**
Male gender, n (%)	2,140 (45.0)	n/r	1,621(46.0)	1,561(45.4)	1,325(45.5)
Mean age at interview (Mean, SD)	17.9 (2.48)	19.2(2.5)	20.6(2.51)	21.5(2.55)	24.5(2.56)
Population group		**n/r**			
Black (n, %)	2,151 (45.3)		1,514(42.8)	1,596(46.4)	1,326(45.5)
Colored (n, %)	2,005 (42.2)		1,673(47.3)	1,583(46)	1,425(48.9)
White (n, %)	596 (12.5)		337(9.5)	249(7.2)	153(5.3)
Indian/Asian (n, %)	-		12(0.32)	11(0.32)	11(0.38)
Marital Status		**n/r**	**n/r**		
Never married (n, %)	4,654(98.9)			3,164(92)	2,486(85.3)
Married (n, %)	49(1.0)			261(7.6)	404(13.9)
Divorced/Widowed (n, %)	3(0.1)			14(0.4)	24(0.8)
Currently in school (n, %)	3,043(64)	1,264(50)	887(57.4)	n/r	n/r
Years of education (mean)	9 (8,11)	n/r	n/r	n/r	n/r
Worked in the last year (n, %)	1,346(28.3)	946(24.1)	2,011(57.0)	1,971(57.3)	682(50.3)
How is your health?, (n, % good)	4,401(92.7)		3,297(93.4)	3,275(95.2)	2,754(94.5)
Have you consumed alcohol? (n,%)	1,083(22.9)	n/r	1,351(38.3)	1,120(32.6)	1,160(39.8)
Have you smoked cigarettes? (n, %)	1,253(26.5)	n/r	1,289(36.5)	1,213(35.3)	1,160(39.8)
Consumed other drugs (n, %)	190(4)	n/r	216(6)	153(4.5)	192(6.6)

Key: - n/r- not reported; n (%) – frequency and percentage; Mean, SD – mean and standard deviation;

NB: a number of questions only appear in Wave 1 and were not repeated in subsequent waves.

Results indicates that the sample was a close balance between males and females, with males representing 45% of the total respondents in Wave 1, 46% in Wave 3, 45.4% in Wave 4, and 45.5% in Wave 5. The mean age at Wave 1 survey was 17.9 years with a range of 14 to 22 years while the mean age at Wave 5 survey was 24.5 years with a range of 20 to 30 years. Majority of the respondents were never married at the time of the surveys, with 1% reporting to be married at Wave 1, and 13.9% by Wave 5. Findings indicate that no significant gender variation in response rates, as differences remained modest throughout the surveys. Mean age of the sample increases with follow-up, findings that are intuitive as respondents advance in age with follow-up.

At Wave 1, only 28.3% of the young respondents reported to have worked in the last year, slightly decreasing to 24.1% by Wave 2, and increasing to 57%, 57.3%, and then decreasing to 50.3% at Wave 3, 4 and 5 respectively. Also, for school enrolment, majority of the respondents were enrolled at school with 64% at Wave 1 and 50%, 57.4% at Wave 2 and 3 respectively. The median duration of schooling at Wave 1 was reported to be nine years that corresponds to basic education in South Africa. Findings on employment and education attainment indicates a general improvement in terms of increasing employment and schooling years during the study period, finding also reported by the World Bank for the year 2014. Generally, young adults described their health to be very good, with over 90% reporting good health at follow-up.

4.2 Sexual and Reproductive Health Indicators

Table 4 reports on the sexual and reproductive health indicators of the young adult respondents across the five waves of the CAPS surveys.

Table 4: Sexual and reproductive health characteristics of the young adult respondents

Sexual and reproductive health indicators	Wave 1 (2002)	Wave 2 a/b (2003/2004)	Wave 3 (2005)	Wave 4 (2006)	Wave 5 (2009/2010)
Ever had sex, n (%)	2,162(46)	881(64.4)	2,508(73.2)	2,735(83.1)	2,661(94.3)
Mean age at first sex, (Mean, SD)	16.2(1.8)	16.1(1.8)	16.5(2.0)	16.6(2.0)	19.4(2.8)
Median Age at first sex, (IQR)	16 (15, 17)	16 (15, 17)	16(15,18)	16(15,18)	20 (18,21)
Use of protection at first sex against disease or pregnancy, n (%)	1,126(52.5)	n/r	1,366(65.9)	1,829(78)	n/r
Use of protection at last sex against disease or pregnancy, n (%)	1,458(71.5)	570(74.4)	1,651(71.3)	1,665(68.9)	1,719(65.1)
Sexual partners whole life, (Median, IQR)	1,(1,2)	1,(1,2)	2,(1,3)	2,(1,4)	1 to 5
Number of sexual partners in the last 12 months (Median, IQR)	1,(1,2)	1,(1,1)	1,(1,1)	1,(1,1)	1,(1,1)
Ever reported a live birth/pregnancy, n (%)	477(10.1)	n/r	815(23.1)	1,024(29.8)	n/r

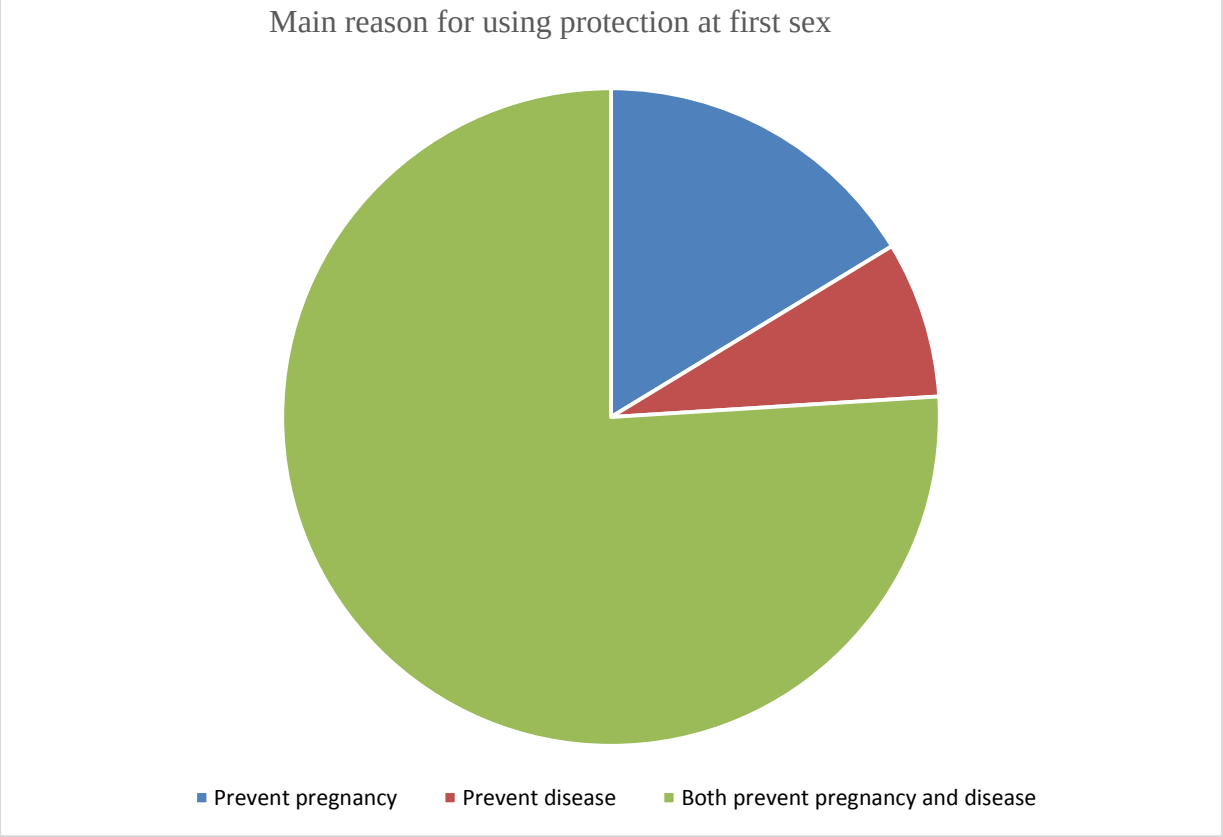
Key: - n/r – not reported, IQR – Interquartile Range

An estimated 46.0% of all adolescents and young adults responding reported ever having sex by Wave 1 survey. No significant sexual experience differences were observed between males and females, with 45.7% of males reporting compared to 46.1% of females at Wave 1 survey. Sexual transition occurs in follow-up with 64.4% reporting sexual experience at Wave 2; 73.2% at Wave 3; 83.1% at Wave 4; and 94.3% by Wave 5. These findings were expected with adolescents and young adults advancing in age, and almost universally reporting transitioning into sexual activity. Literature reports that delaying sexual activity may be beneficial to the adolescent as it is associated with more safe sex practices. Mean age at sex debut was reported at 16.2 (SD 1.8)

years for both males and females. In KwaZulu-Natal, the mean age at first sex among girls aged 15-24 years, was reported at 16 years(Manzini, 2001).

Use of protection against disease and pregnancy at first sex was reported at 52.5% at Wave 1, 65.9% at Wave 3, and 78% by Wave 4 indicating increasing awareness around safe sex over the follow-up period. Reasons for protection use at first sex were mainly to prevent both disease and pregnancy at 76% compared to pregnancy only at 16.3% and disease only 7.7%. Use of protection against contracting pregnancy or disease at last sex was at 71.5% at Wave 1 and was reported at 65.1% by Wave 5.

Figure 3: Reasons for protection use at first sex.



In terms of condom use, this study finds that 69% of the respondents reported always using condoms, and only 6% reporting rarely using condoms at Wave 1. This proportion increased to 77% at Wave 2 of the survey, while those rarely using condoms stood at 7%, with no significant differences observed between males and females. The main reasons for using condoms were protection from contracting STIs and a form of contraception as indicated in Figure 3.

The observed levels of protection use at sex initiation increases with advancing age, indicating that delaying first sexual activity may be associated with increasing safe sex awareness. Research has reported that using condoms at sex debut predicts condom use in subsequent sexual activity therefore delaying sexual initiation may be associated with future increased condom use (Hendriksen, Pettifor, Lee, Coates, & Rees, 2007). Studies reporting on reasons for using condoms at last sex among men and women aged 15-24 years in KwaZulu-Natal, observed that up to 59% of respondents used condoms at last sex, with up to 64% using condoms to prevent both pregnancy and HIV infection (Maharaj, 2006). Among young people considering pregnancy as a problematic outcome were more likely to use condoms. Similar findings have been obtained here where the adolescent and young adult respondents were mainly using condoms to protect themselves from both HIV and pregnancy. However, levels of condom use at first sex, may vary according to age of sex debut and type of relationship the sex activity is initiated.

In terms of multiple sexual partnerships, adolescents and young adults reported having sexual relations with between one and three partners in the last year during the survey period. Lifetime sexual partners increased with follow-up indicative of new sexual partnerships formed as young adults advanced with age reporting between one and five lifetime partners at Wave 5 survey. In terms of pregnancy experience, 10.1% of the young women reported ever experiencing

pregnancy or live birth by Wave 1, increasing to 29.8% by Wave 5. Tables 5 and 6 present trends in sexual and reproductive health indicators for males and females over the survey period.

Table 5: Trends in sexual and reproductive health outcomes for males

Males	Wave 1 (n=2,114)	Wave 2 (n=623)	Wave 3 (n=1574)	Wave 4 (n=1,485)	Wave 5 (n=1,263)
Sexually Experienced (n, %)	967(46%)	413(66%)	1,165(74%)	1,247(84%)	1,205(95%)
Age at Sexual Initiation (Mean, SD)	15.7 (1.8)	15.6(1.7)	16.0(1.9)	16.0(2.0)	18.3(3)
Willing to have first sex*, n (%)	926(96%)	301(94%)	1,037 (96%)	n/r	n/r
Always used condom last sex*, n (%)	469(71.6%)	195(77.4%)	n/r	n/r	n/r
MSP in last 12 months*, n (%)	401(50%)	n/r	265(29%)	398(43%)	415(41%)
Use protection at last Sex*, n (%)	692(77%)	267(77%)	780(77%)	769(74%)	793(72%)
Made someone pregnant (n, %)	123(6%)	n/r	260(16%)	331(21%)	n/r

*Key: * % based on non-missing responses, n/r not reporting*

Sexual experience, condom use, and sexual partnerships indicators are all analysed and reported.

Table 6: Trends in sexual and reproductive health outcomes for females

Females	Wave 1 (n=2590)	Wave 2 (n=745)	Wave 3 (n=1,852)	Wave 4 (n=1,806)	Wave 5 (n=1,560)
Sexually experienced (n, %)	1,195(46 %)	468 (63%)	1,343(73%)	1,488(82%)	1,456(93%)
Age at sexual initiation (Mean, SD)	16.6(1.7)	16.5(1.7)	16.9(1.9)	17(1.9)	20.2(2.2)
Willing to have first sex*, n (%)	1,010(85%)	383(82%)	1,114(83%)	n/r	n/r
Used condoms last sex*, n (%)	405(66.2%)	218(77.3%)			
MSP in last 12 months* (n, %)	198(19%)	n/r	89(8%)	150(12%)	162(13%)
Use protection at last sex* (n, %)	766(68%)	303(73%)	871(70%)	896(66%)	926(67%)
Ever been pregnant* (n, %)	443(17%)	n/r	675(35%)	826(44%)	n/r

*Key: * % based on non-missing responses – denominator not reported, n/r not reporting*

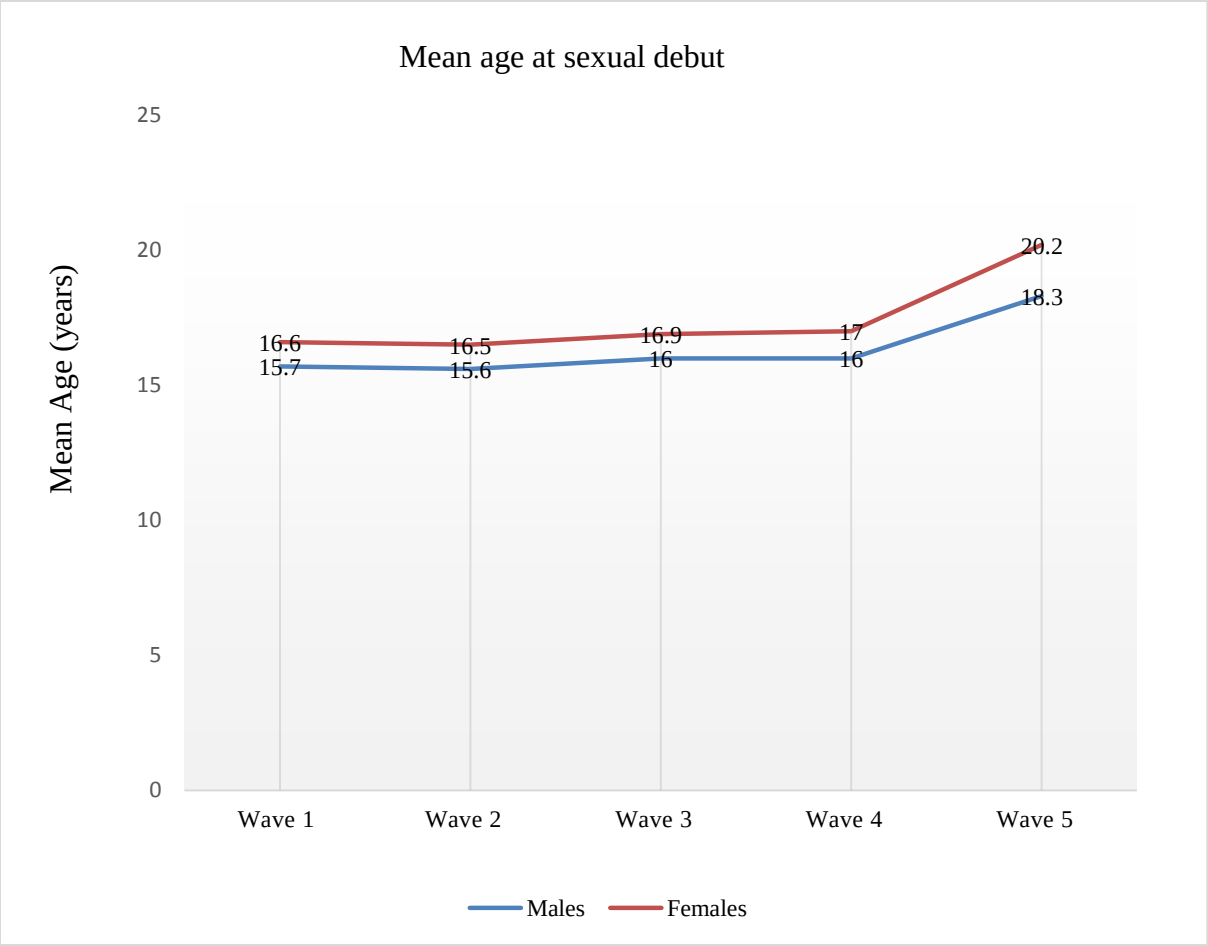
Willing to have first sex implies that the sexual activity was consensual, not coerced or defilement.

For males, sexual experience was reported at 46% at Wave 1 survey increasing to 95% by the Wave 5 survey as reported in Table 5. Majority of males reported to have had consensual sex relationships throughout the surveys, with 96% of males reporting sexual experience, having been willing to have first sex. Similar trends were observed for females, with sexual experience at Wave 1 survey reported at 46%, increasing to 93% by Wave 5 as shown in Table 6. A substantial proportion of female respondents reported coerced or forced first sex activity, with 15% reporting not willing to have first sex. Willingness to have first sex slightly differs by gender, where a higher proportion of males compared to females, reported consenting to first sex. The mean age at first sex for males was 15.7 (SD 1.8) years for males compared to 16.6 (SD 1.7) years for females at Wave 1, implying that males became sexually experienced at a younger age compared to females. Previous studies reporting on age at first sexual have identified slight gender differences at mean age of first sex, with males becoming sexually experienced much earlier compared to females(Shisana et al., 2009; Zuma et al., 2011; Zuma et al., 2010). Pettifor et al (2009) observed that among 15-19 year old respondents from a nationally representative survey in South Africa, 50% of males, and 47% of females reported ever having sex (Pettifor et al., 2009). Further, reported mean age at first sex was reported at 16.4 years for males, and 16.8 years for females, findings that were consistent with this study. However, this study does not identify substantial gender differences in terms of sexual experience, with 46% of both males and females reporting sexual experience at Wave 1, and 95% of males and 93% of females reporting by Wave 5.

Findings from these analyses indicate that males consistently initiate sexual activity at a younger age compared to females, observing a mean age of 15.7 years for males and 16.6 years for

females at Wave 1, and 18.3 years for males and 20.2 years for females at Wave 5 survey. Figure 4 shows that over the follow-up, males consistently reported lower average age at first sex.

Figure 4: Mean age at sexual debut at baseline and follow-up

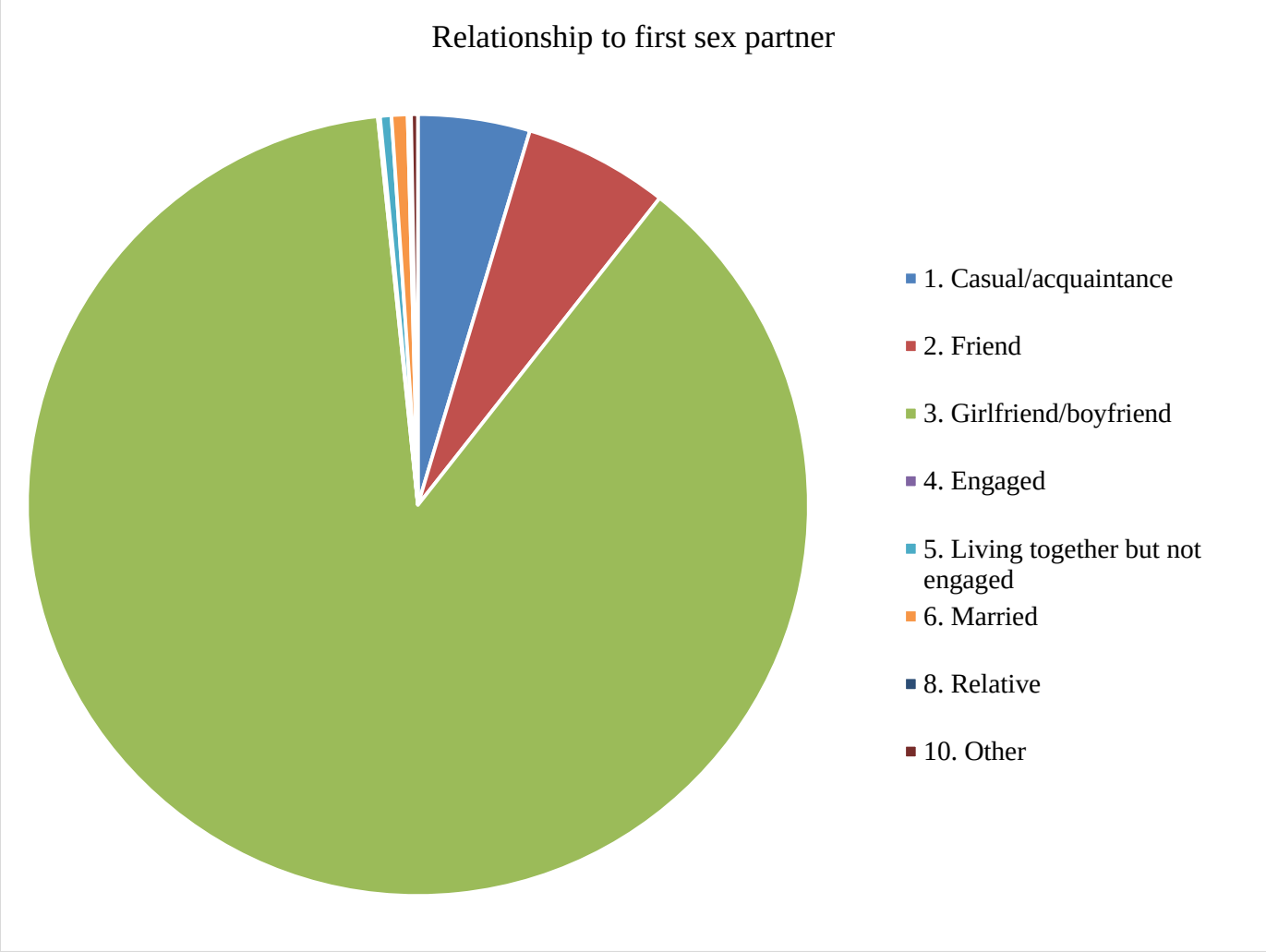


The findings of about 46% of adolescents and young adults reporting sexual activity before the age of 15 years have been reported before, where an estimated 50% of young people are reported to be sexually active before the age of 15 years(L. Eaton et al., 2003).

Relationship to first sex partner indicates that adolescents and young adult sexual relationships mostly involved their boyfriends or girlfriends. Reported sexual partner at first sex was mainly the boyfriend or girlfriend of the respondent, reporting 88% of all the time, as indicated on

Figure 5. Males also reported casual acquaintances at 8.3% compared to females at only 1.7%. Majority of females had first sex in committed relationships including marriage, while engaged to partners, living together, and also with relatives.

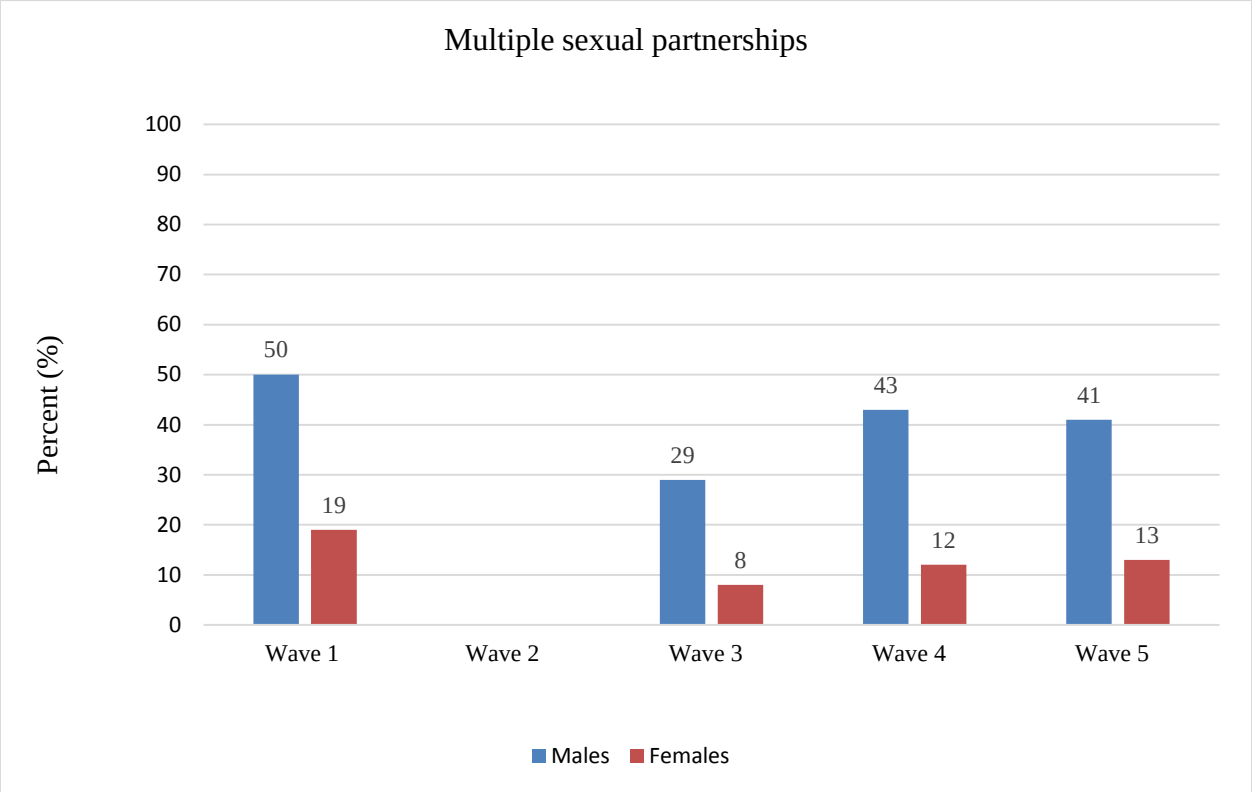
Figure 5: Adolescents and young adult's relationship to first sex partner



Similar trends were observed over time, with reports of last sexual partner depicting that sexual relationships were mostly between boyfriends and girlfriends as reported on Figure 5. These findings imply that sexual relationships among school attending adolescents and young adults occurs with their age mates. Contrary to previous findings where young women had first sexual

encounter through coercion or partnering with older men, these findings suggest that young women had first sex mainly with their age mates (Harrison et al., 2012). Therefore, safe sexual messages could be targeted to schooling institutions, and have the potential to be most effective. Findings indicate that among school attending children, their first sexual partners are likely to be their girlfriends or boyfriends in their age group.

Figure 6: Reports of multiple sexual partnerships in the last year



Note: - Wave 2 data missing on multiple partnership indicators

Reports of having sexual relationships with more than one partner in the last twelve months were high among males, observed at 50% at Wave 1 compared to 19% in females. These proportions, however, decreased over time to 41% at Wave 5 for males and 13% for females as depicted on Figure 6. Overall, a higher proportion of males reported more lifetime partners compared to

females. The trend points to a decline in the number of partnerships over the follow-up period even though the prevailing levels are still high. These findings also indicate that government programmes of safe sex communications during the height of the HIV and AIDS epidemic may be effective in adopting behaviour change. Previously studies have reported on the critical aspect of multiple and concurrent sexual partnerships to the prevailing HIV and AIDS epidemic in sub-Saharan Africa, arguing that the spread of HIV is faster in the presence of multiple partnerships(Watts & May, 1992).

4.3 HIV/AIDS Awareness

The CAPS also collected data on adolescent and young adult HIV and AIDS awareness, assessing their knowledge and perceived risks of contracting HIV disease. Table 7 provides the summary.

Table 7: Protection from HIV and risk of infection

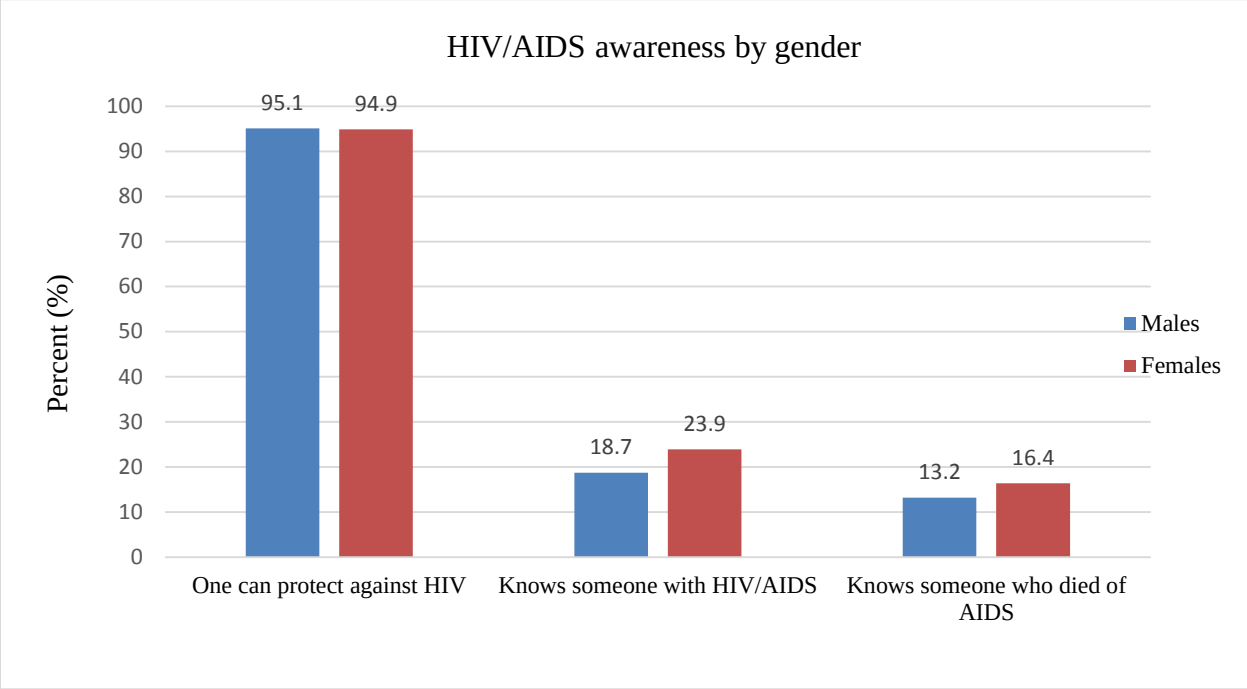
HIV/AIDS awareness	Wave 1 (2002) n=4,735	Wave 2 a/b (2003/2004) n=1,367	Wave 3 (2005) n=3,523	Wave 4 (2006) n=3, 442	Wave 5 (2009/2010) n=2, 930
Can one protect from HIV? n (%)	4,503(95.0)	n/r	3,364(95.5)	n/r	n/r
Knows someone with HIV/AIDS, n (%)	710(15.0)	578(42.3)	976(27.7)	843(24.5)	937(32.1)
At no risk of HIV, n (%)	2,662(56.1)	803(58.8)	1,703(48.4)	1,471(42.8)	1,312(45.2)
Knows someone died from HIV/AIDS, n (%)	1,023(21.5)	n/r	1,117(31.2)	988(28.7)	962(33)

Key: - n/r – not reported

A high proportion responded positively to knowing an effective method for HIV protection with 95% reporting at Wave 1 and 95.5% at Wave 3. These findings contradict global reports where evidence indicate that adolescents and young adults did not know the modes of HIV transmission and ways they could protect themselves from HIV infection (UNAIDS, 2012). Either, the CAPS

survey merely seeking responses from young respondents may obtain biased responses without an objective assessment of HIV knowledge, or findings from the UNAIDS global report may not reflect the context of youths in South Africa. Also, a substantial number of respondents knew someone living with HIV, with 15% reporting at Wave 1 increasing steadily to 32.1% at Wave 5. Slightly a higher number of respondents knew someone who had died from AIDS compared to those who knew someone living with HIV, at 21.5% at Wave 1 and 33% at Wave 5. Figure 7 shows HIV awareness by gender at Wave 1.

Figure 7: HIV/AIDS awareness by gender at Wave 1

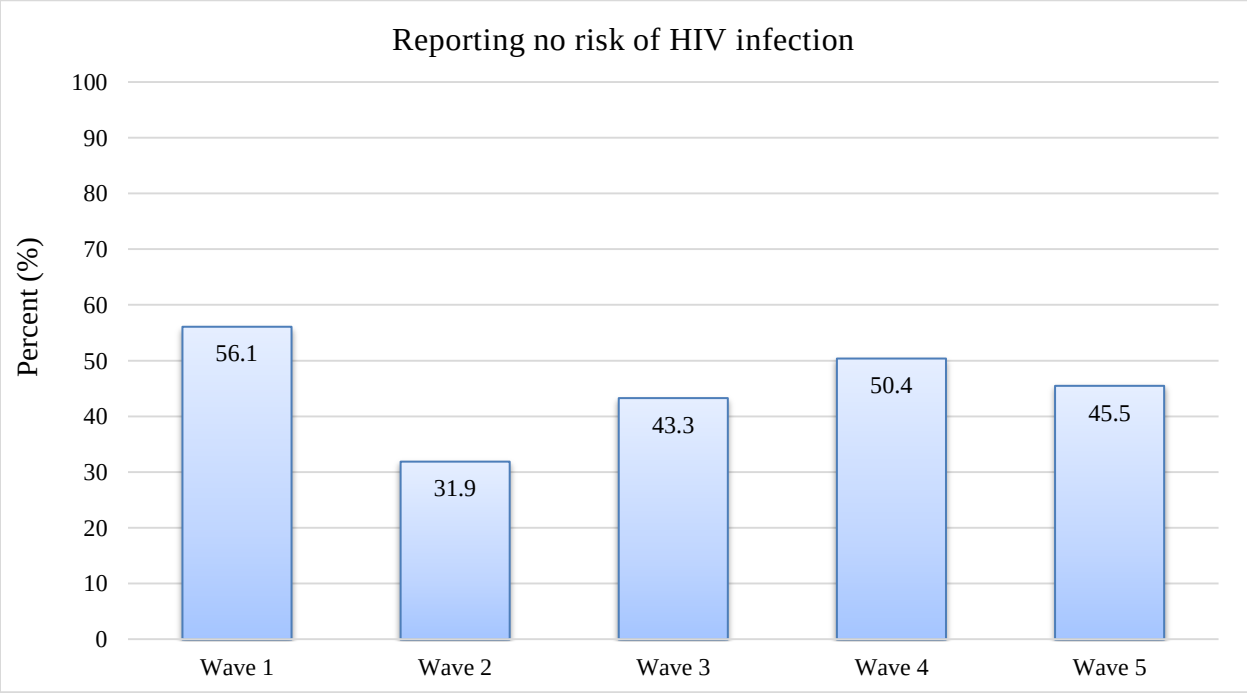


No major differences were observed by gender regarding HIV knowledge as shown on Figure 7. However, more females than males were aware of someone who living with HIV or knew someone who dying from HIV and AIDS, indicative of more young women taking care of parents or relatives suffering from AIDS. Research studies in South Africa, have reported that

caring for parents or relatives living with HIV is a traumatic experience, with mainly young women assuming the role of a caregiver (Meinck, Cluver, & Boyes, 2015).

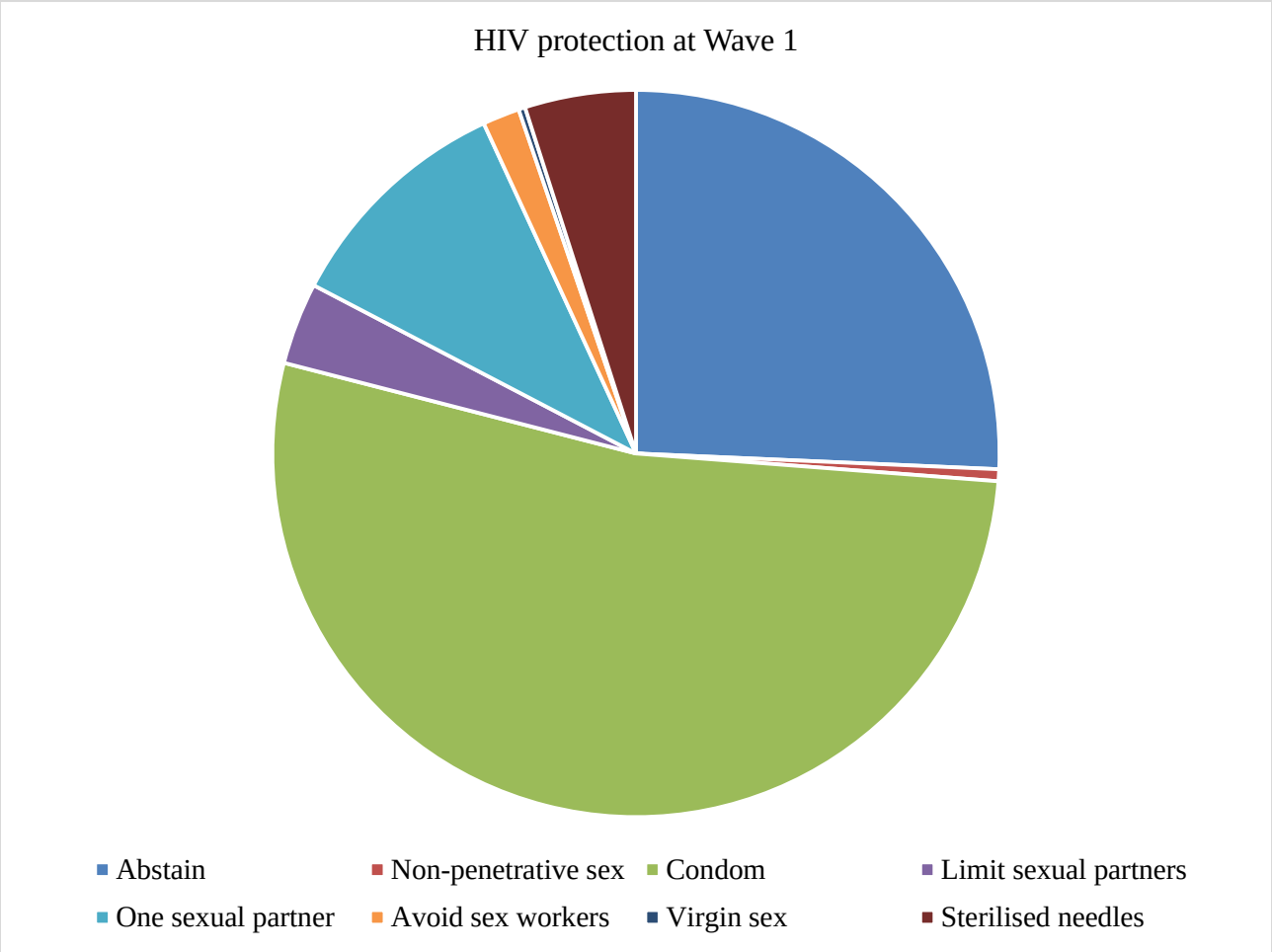
In terms of HIV risk perception, 56.1% of adolescents and young adults responding felt that they were at no risk of HIV infection at baseline, with 31.9%, 43.3%, 50.4%, and 45.5% reporting no risk of HIV infection at Waves 2, 3, 4, and 5 respectively. These findings indicate that respondents were feeling at a relatively low risk of HIV infection even though the risk perception increased with follow-up. Previous studies in sub-Saharan Africa have not necessarily found any relationship between HIV knowledge and perceived risk(Barden-O'Fallon et al., 2004). Similar findings have been reported from research studies within South Africa, where young adults perceive themselves to be at no risk of HIV infection, even though HIV transmission has been reported to be high in this age group. Figure 8 reports on the trend in risk perception among the respondents.

Figure 8: Young adult HIV risk perception



The importance of risk perception to reducing risk-taking behaviours has previously been established in South Africa, with risk perception associated with increasing HIV testing among females but no significant effect on males (Tenkorang, 2016). Adolescents and young adults also reported on their perceived effectiveness of HIV prevention interventions. At Wave 1, majority of respondents reported using condoms could protect from HIV infection. Figure 9 shows modes of HIV protection as reported at Wave 1.

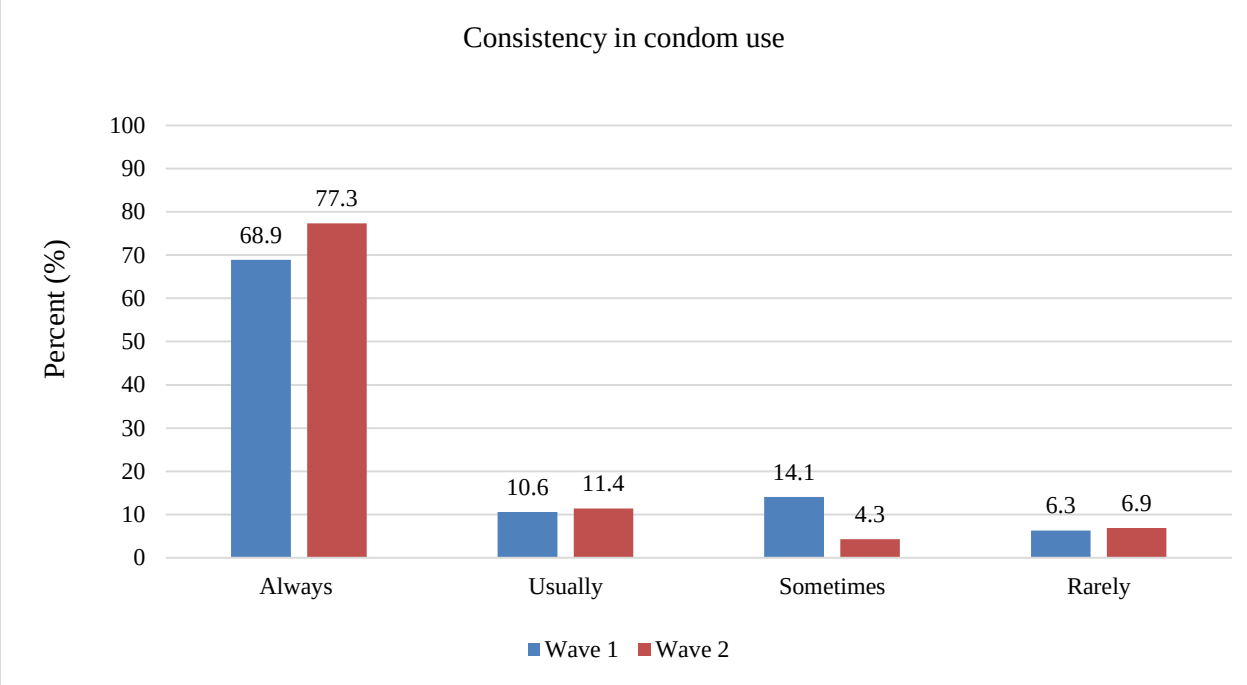
Figure 9: HIV protection at Wave 1



Unprotected sex among youths aged 15 to 24 years is the primary mode of HIV infection in South Africa (Scott-Sheldon, Walstrom, Harrison, Kalichman, & Carey, 2013).

Therefore, a high proportion of respondents reporting condom use as protective is good for adolescents and young adults in South Africa in HIV epidemic prevention. Figure 10 reports on consistency of condom use as reported.

Figure 10: Consistency in use of condoms among adolescents and young adults



Reports of condom use with last sex partner indicate that majority of the respondents reported always-using condoms with 68.9% at Wave 1 and 77.3% at Wave 2. Only a small percentage at 6.3% at Wave 1 and 6.9% at Wave 2 reported to 'rarely' using condoms. Trends in condom use indicate a slight increase for 'always' and 'usually', and a drastic decrease for 'sometimes' respondents, with no significant change observed for those reporting 'rarely' in condom use.

Studies in South Africa have reported that even with high levels of HIV awareness among the youth, perceived vulnerability and condom use may be low (MacPhail & Campbell, 2001). In response to STIs and HIVV challenges, the government of South Africa responded by providing access to both male and female condoms to the public (Beksinska et al., 2012). As a result,

national surveys have observed progressive increases in condoms use at last sex, a trend that was also observed from these analyses.

4.4 Adolescent and Young Adult Pregnancy

CAPS data also reported on pregnancy occurrence as reported by the adolescents and young adults. At Wave 1 survey, 12.5% of males reported ever making someone pregnant, with 36.7% of female respondents reporting to ever being pregnant. In subsequent surveys, this indicator was merged and 37.1% and 32.9% reported ever being or made someone pregnant at Wave 3 and 4 respectively.

Table 8: Outcomes of adolescent and underage pregnancy

Teenage pregnancy awareness*	Wave 1 (2002)	Wave 3 (2005)	Wave 4 (2006)	Wave 5 (2009/2010)
Ever made someone pregnant, n (%)	123(12.5)	n/r	n/r	n/r
Ever been pregnant, n (%)	443(36.7)	n/r	n/r	n/r
Currently pregnant, n (%)	59(13)	72(2)	92(2.7)	131(9)
Age at first pregnancy (Median, IQR)	n/r	19, (17,21)	19,(21,18)	n/r
Age of the person who made you pregnant first time (Median, IQR)	20, (19,23)	22,(19,25)	21,(19,25)	n/r
Relationship to person who made you pregnant (girlfriend/boyfriend)	394(88.7%)	n/r	n/r	n/r
Ever been/ made someone pregnant, n (%)	n/r	916(37.1)	1,132(32.9)	n/r
Outcome of first pregnancy (live birth), n (%)	n/r	121(85.8)	1,011(89.3)	n/r

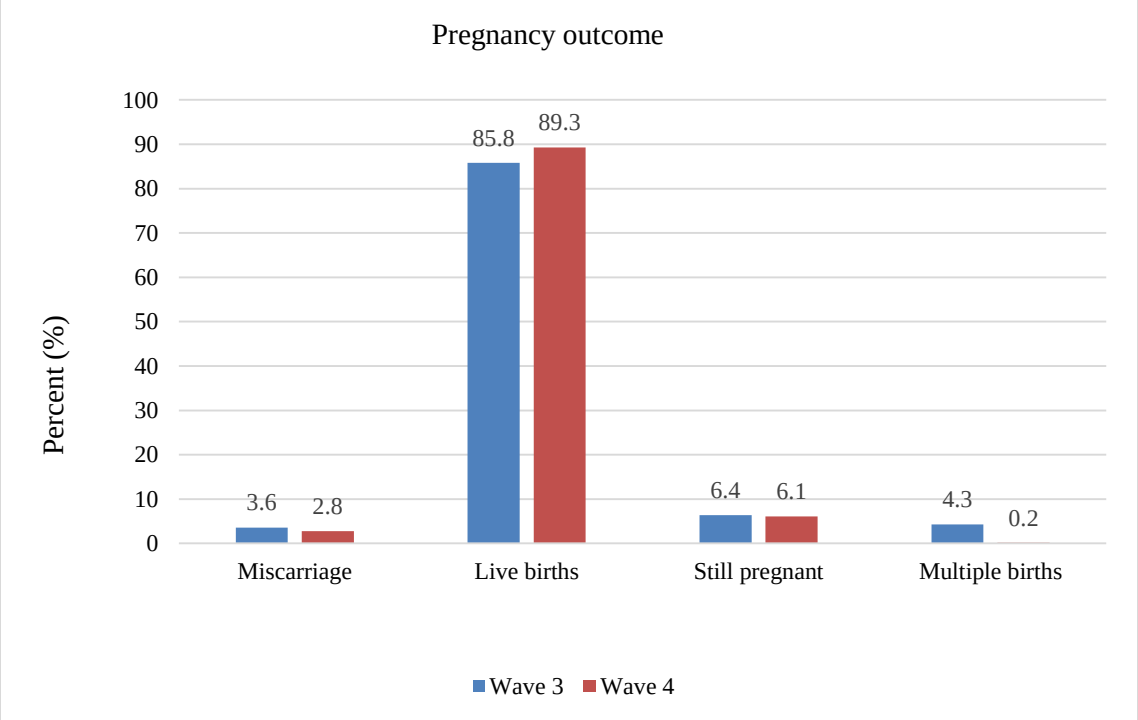
*Key: - n/r – not reported; *- reported for non-missing responses and may not have standard denominator*

A number of females had experienced pregnancy during the survey period, with majority reporting that their boyfriends were responsible for making them pregnant at 88.7%. The median

age at pregnancy for females was 19 for both Wave 3 and 4, an age that corresponds with the age of the person who made them pregnant with a median of 20, 22, and 21 at Waves 1, 3, and 4 surveys. These findings further confirms that sexual relations occurring among adolescents and young adults were with people they referred to as their boyfriend/girlfriend, with occasional cases of intergenerational sex. Studies in South Africa have reported on proportions reporting ever being pregnant, with Jewkes et al (2009) reporting up to 30% of females, ever being pregnant before the age of 20 years(Jewkes et al., 2009). Findings from this study are consistent with these finding as up to 36% of females aged below 22 years were observed to report giving birth.

The main outcome of first pregnancy was live birth at 85.8% at Wave 3 and 89.3% at Wave 4 with miscarriages reported at 3.4% and 2.8% for Wave 3 and 4 respectively. Figure 11 shows pregnancy outcomes as reported during follow-up.

Figure 11: First pregnancy outcome



Pregnancy outcomes for adolescents and young adults are important and act as important predictor of young mother's health. Studies from sub-Saharan Africa have reported increased birth complications for mothers 10-19 years compared to 20-24 years, with adolescent pregnancy associated with increased risk of adverse pregnancy outcomes (Ganchimeg et al., 2014). Abortions and still birth outcomes may increase a young mother's risk of mortality that are important aspects of demography. This data misses important indicators for maternal mortality that may emanate from pregnancy related complications.

4.5 Context and Future Expectations

To understand the context in which young adults grew up, and their future expectations and aspirations, CAPS surveys reported on a number of related indicators.

Table 9: Upbringing, future aspirations and expectations

Upbringing, future aspirations and expectations	Wave 1 (2002) n=4,752	Wave 3 (2005) n=835	Wave 4 (2006) n=478	Wave 5 (2009/2010)
Growing up, you were not often put down by an adult	2,451(51.6)	n/r	n/r	n/r
Growing up, you were never afraid of being hurt	3,444(72.3)	n/r	n/r	n/r
Growing up, you were not often pushed	3,298(69.5)	n/r	n/r	n/r
Type of place where spent most of your life – formal urban	3,338(70.9)	n/r	n/r	n/r
Expects a job in 3 years, n (%)	407 (25.7)	n/r	n/r	n/r
Age expects first child, (Median, IQR)	27,(25,30)	27, (25, 30)	n/r	n/r
Age expects to marry, (Median, IQR)	27,(25,30)	27, (25, 30)	n/r	n/r
Plans to pass Matric, n (%)	2,714(91.1)	610(73.2)	374(78.4)	n/r

Key: - n/r – not reported,

Indicators of expectations, aspirations, and upbringing were mainly asked at Wave 1 and 2 surveys. The results show that almost half (48.4%) of the young adults were ever put down by an adult as they were growing up. Majority of young adults grew up in homes where they were never afraid of being hurt (72.3%), and were never pushed as they grew up (69.5%). Findings also show that adolescents and young adults grew up in locations that could be considered urban or formal urban with 71% of respondents reporting. In terms of expectations, very few adolescents at baseline were expecting to be working three years from the Wave 1 survey (25.7%). Majority of respondents also expressed their future plans of passing their matric exams at the first attempt with 91.1%, 73.2, and 78.4 for Wave 1, 3, and 4 respectively.

Previous studies in South Africa have indicated that self-efficacy and future time perspective were qualities that protect adolescents from engaging from risky sexual behaviours (Abousselam, Naude, Lens, & Esterhuyse, 2016). Findings from these analyses show that a high proportion of adolescents and young adults were planning to pass their matric exams, and this may predict outcomes of risky sexual behaviour.

4.6 Familial, Household and Community Characteristics

Familial, household, and community level responses were collected during the CAPS surveys and are summarized to give an overview of contexts of responding adolescents and young adults. Familial and household level descriptive results are reported on Table 10. Findings indicate that less than half of respondents had fathers residing with 42.8% having a resident father, and 68.3% resided with a mother. This proportion increased during follow-up, and 53.4% reported a resident father, and 78% reported a resident mother at Wave 2.

A higher proportion of fathers were working when compared to mothers, reporting 49.7% for fathers and 39.2% for mothers at Wave 1, with employment increasing steadily to 55.8% for fathers and only marginally for mothers at 39.7% at Wave 2.

Table 10: Familial and household level characteristics

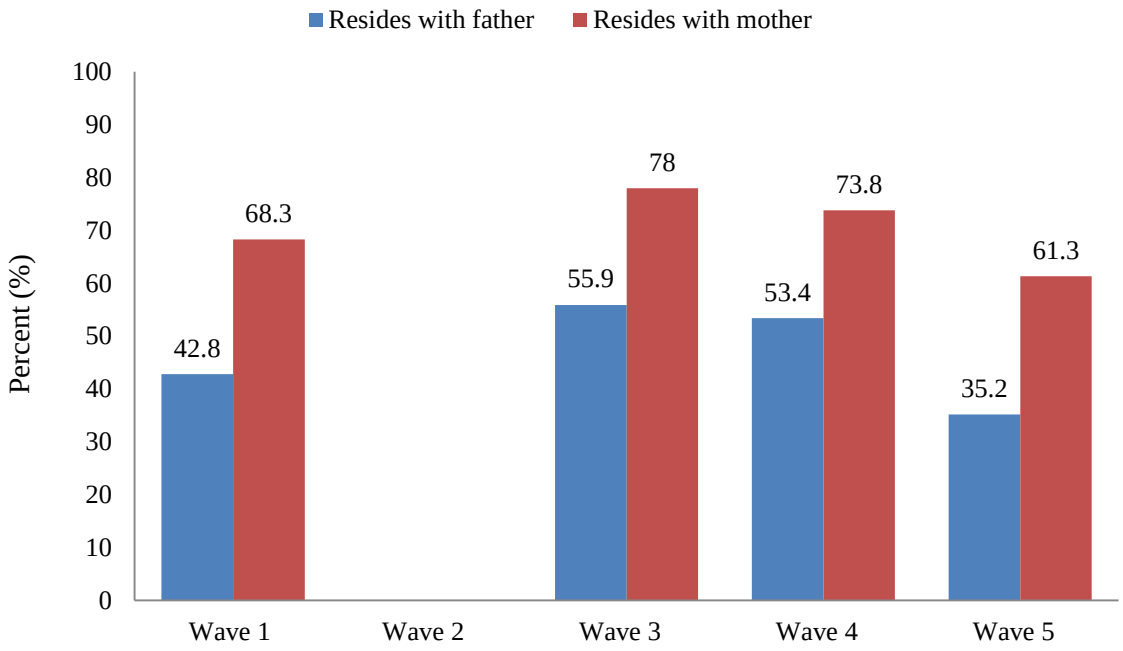
Household level variables	Wave 1 n=4,752	Wave 2 a/b	Wave 3	Wave 4	Wave 5
Resides with father (n, %)	2,033(42.8)		1,490(55.9)	1,382(53.4)	1,025(35.2)
Resides with mother (n, %)	3,247(68.3)		2,509(78)	2,308(73.8)	1,788(61.3)
Mother working (n, %)	480(39.3)		280(39.7)		
Father working (n, %)	882(49.7)		657(55.8)		
Father a HH member, n (%)	2.048(43.2)				
Father helped with homework (n, %)	414(8.7)	112(9.2)			
Father's years of school, (Median, IQ)	9,(7,12)				
Biological father often buys clothing (n, %)	2,057(52.1)				
Mother a member of this household (n, %)	3,260 (68.6)				
Mother's years of schooling (n, %)	9, (7,11)				
Mother helped with homework (n, %)	803(16.9)	185(15)			
Mother often spent time with you (n, %)	2,310(51.7)		1,540(47.9)		
Mother gave money for school things (n, %)	2,482(55.9)		1,183(36.8)		
Mother gave money for non-school (n, %)	3,469(77.9)		2,235(69.5)		
Mother influences most on school (n, %)	2,965(62.5)		2,539(71.9)		
Father influences you most at school (n, %)	608(12.8)		271(7.7)		
Meals in the last 7 days in this household (Median, IQR)	4,(4,4)		3,(3,4)		
Mother never discusses personal things (n, %)	1,119(25.1)				
Father never discusses personal things (n, %)	2,059(52.2)				
Parents married at birth, n (%)	3,567 (76.0)				
Number of full siblings (Median, IQR)	2(1,3)				
Mother never spends time with you (n, %)	627(14.0)		309(9.6)		
Father never spends time with you (n, %)	1,466(37.2)		740(27.8)		
Father gave money for school things (n, %)	1,811(46)		854(32)		

Findings indicate that mothers assisted the respondents more with homework compared to fathers at 16.9% and 8.7% respectively, with mothers giving money more frequently to the respondents than fathers did, at 55.9% and 46% respectively. In addition, mothers ended up influencing the respondent more than fathers did, with 62.5% saying mothers influence them on

school matters compared to only 12.8% for the fathers. These findings showing that mothers had more influence over the adolescents and young adults' upbringing may be targeted to improve behaviour and educational outcomes among this group.

Findings also show that 76% of the adolescent and young adults reported that their parents were married at birth, and that the median number of siblings at baseline were two. In summary, findings show that mothers had more influence on respondents' schooling compared to fathers. In addition, money for school and non-school things was more frequently provided by mothers compared to fathers. Also, Figure 12 shows that majority of young adults resided with their mothers as compared to their fathers.

Figure 12: Adolescent and young adult respondent resides with father or mother



Note: Wave 2 missing young adult residence with mother or father

Findings showing that adolescents and young adults resided mainly with their mothers as compared to their fathers may be an important finding for demographic analyses of the South

African population. Stats SA in a report analyzing the living arrangements of young children in South Africa indicates that even though 93% of children have both biological parents, only 36% of these children live with both of them, while 43% live with their biological mothers (StatsSA, 2013c). Overall, mothers had a stronger influence on adolescents and young adults responding as compared to fathers with regard to their choices. Findings indicate that mothers spent more time with the young adults, influenced them more even at school, and discussed personal things more frequently with the respondents than fathers did.

A number of community level responses were collected at baseline using responses from the households' heads and described to give the context in which young adult lived. Table 11 shows that at Wave 1 survey, a substantial number of households were headed by females with a median of 40%. A small proportion of the households interviewed were living in informal settlements reporting at 2% at baseline.

Table 11: Community level indicators

Community level variables*	Wave 1 (2002) n=4,752	Wave 2 a/b (2003/2004)	Wave 3 (2005)	Wave 4 (2006)	Wave 5 (2009/2010)
Percentage of households headed by females	40 (32 - 45)	n/r	n/r	n/r	n/r
Percentage living in informal dwelling	2 (0 - 41)	n/r	n/r	n/r	n/r
Percentage households with piped water	77 (12 - 92)	n/r	n/r	n/r	n/r
Percentage electricity for lighting	97 (88 - 99)	n/r	n/r	n/r	n/r
Mean annual household income	40,542 (19,000-63,700)	n/r	n/r	n/r	n/r
Poverty Indicator – HH below poverty line	23 (14 - 44)	n/r	n/r	n/r	n/r
Percentage households unemployed	16 (8.3 - 30.2)	n/r	n/r	n/r	n/r
Mean years of schooling	9 (8 - 10)	n/r	n/r	n/r	n/r

*Key: - n/r – not reporting, * Median, IQR*

Table 11 shows, majority of households had access to piped water (77%), with almost every household having access to community electricity for lighting purposes (97%). Even though only 16.8% of household heads were unemployed, 23% of the households were living below the poverty line on community average. The mean year of schooling for communities was a median of nine years indicating achieving basic education in the South African education system.

4.7 Discussion and Conclusion

In conclusion, this chapter presented a description of the adolescent and young adult sample, summarizing responses for various indicators emanating from the CAPS surveys. Where indicators were reported in consecutive waves, this provided trends over time, of the levels of indicators of sexual behaviours, individual, household and community level characteristics. A number of variables were collected at baseline and follow-up, even though; this was not the case for community level responses that were only collected at baseline. This chapter describes the sexual and reproductive health behaviours, perceptions, characteristics of young adults, and the context in which they lived. Household and community characteristics have also been presented to give a background understanding of the socio-economic context from which the sample was obtained, and the familial conditions of upbringing for the young adults sampled. Results describing characteristics of adolescents and young adults of the CAPS sample informs outcomes of risky sexual behaviours, which are relevant for demography and population studies.

Findings from this study identify key aspects of the adolescent and young adult sample, including race and gender differences, across the waves of the surveys. Males reported lower mean ages at sex initiation compared to females and males also reported more willing to have

first sex compared to females. Reporting MSPs was also different between males and females, with males consistently reporting a higher number of sexual partnerships in the last year. HIV and AIDS awareness were not significantly different for knowledge of protecting from HIV transmission, but a higher proportion of females knew someone suffering or dying from AIDS. Results identify differences by gender and race for key indicators, factors consistently reported to be significantly different in demographic research, and influences further multivariable analysis in this study where analyses are conducted separately for males and females.

Results showing that young women were significantly more aware of people living and dying of HIV and AIDS are relevant for demography as it may indicate gendered roles where young women take care of their sick parents or relatives. Previous studies in sub-Saharan Africa have associated the effect of the HIV epidemic on schooling outcomes when having a sick parent or relative. In Zimbabwe, young caregivers aged 16-17 years were more likely to be absent from secondary school, and were likely to be associated with not being in the correct age-grade category (Pufall et al., 2014). More evidence indicate that AIDS – related orphans experience worse education outcomes further jeopardizing future productivity (Guo, Li, & Sherr, 2012). Education outcomes have impact on any country achieving a demographic dividend, as youths need to be learned, and possessing skills that positively contribute to economic advancement. Early pregnancy is associated with poor socio-economic outcomes of education and training to the young mother, which lowers their future prospects of economic contribution. Besides, research continues to draw links between low education achievements to unmet need for contraception that has important implication for fertility rates. Even though impact of early pregnancy on future fertility trends have not been well described, and further research is recommended to understand its potential impact.

Findings related to early pregnancy are important in the field of demography and population studies as they impact on mortality rates of a population. Early pregnancy has been associated with increased maternal and infant mortality that are relevant for demography. Early childbearing is associated with increased maternal mortality resulting from birth complications to the mother and the newborn as young mothers have not fully matured to deliver safely (Chandra-Mouli, McCarraher, Phillips, Williamson, & Hainsworth, 2014; Koch et al., 2015). Furthermore, early child bearing is also associated with poor outcomes for newborn babies, with a higher risk of pre-term births that increase infant and child mortality. In some South American countries studies have shown that rates of newborn deaths are 50% higher for adolescent mothers compared to mothers in their 20s (Conde-Agudelo et al., 2005).

CHAPTER 5: DETERMINANTS OF EARLY AGE AT SEX DEBUT

5.0 Introduction

This chapter gives the results from investigating the ecological determinants of early age at sexual debut among adolescents and young adults. Sexual debut refers to first sexual activity or full penetrative vaginal intercourse in a heterosexual relationship. The CAPS survey captures this information using the young adult questionnaire where respondents were asked, "Have you ever had sexual intercourse?" throughout the waves of the survey. A further follow-up question on age at first sexual intercourse was asked through "Age at first sexual intercourse" whenever a young adult reported first sexual intercourse experience.

Early age at sexual debut is defined by WHO as sexual activity before the age of 15 years(UNESCO, 2012). Since early age at sexual debut exposes adolescents and young adults to the risk of unwanted pregnancy and sexually transmitted diseases, this research identifies early sex initiation as a sexual risky behaviour for investigation. Previous reports have indicated that adolescents and young adults may initiate sexual intercourse early, despite the multiple risks of pregnancy and sexually transmitted disease including HIV. Early sexual debut has been associated with a variety of concurrent risk factors and is important in HIV infection and teenage pregnancy. Understanding factors that influence an adolescent's decision to have sexual intercourse has important implications for theory, policy and practice.

The health hazards of early sexual activity are well reported by a number of studies that have reported on correlates of age at first sex (McGrath et al., 2009; Onoya et al., 2014; Zuma et al., 2011; Zuma et al., 2010). It has been argued that in communities where early childbearing is common, and HIV prevalence is high, adolescents may be at a particular risk of HIV because of

positive attitudes to unprotected sex (Rutenberg et al., 2003). These studies have reported on the influence of factors at individual, household, and community level. However, studies have often reported on these risk factors in isolation and there is a dearth of research on how these factors act cumulatively to influence early sexual debut.

In South Africa, the HIV/AIDS epidemic among the youth has resulted in a reduction of life expectancy, while a high rate of teenage pregnancy has negatively impacted on schooling outcomes. In this chapter, determinants of transitioning into early sexual debut among adolescents and young adults in urban South Africa were investigated. A cumulative risk factor approach was adopted to integrate risk factors occurring at individual, household, and community level (Bronfenbrenner, 1979, 1988; Small & Luster, 1994). This approach argues that significant risk factors occur at multiple levels of the adolescent's life and their effect tends to be cumulative, implying that the more the risk factors an adolescent was exposed to, the greater the likelihood of initiating early sexual activity.

5.1 Dependent and Independent Variables

Early age at sexual debut was the dependent variable in this study and was defined as per the WHO recommendation of penetrative sex intercourse before the age of 15 years. Adolescents and young adults who reported to be sexually active also reported on the age at their first sexual intercourse that was used to construct this outcome variable. Independent variables considered for aforementioned outcome of early age at sex debut consisted of factors at the individual, household, and community level factors. On the individual level, factors investigated included race, school achievements and aspirations, history of sexual abuse, marital status, employment, family size, ability to make personal decisions about health, and knowledge of HIV. At household level, risk factors include socio-economic status of the family, living with single or

both parents, parental monitoring and supervision, closeness to the parents, and parental education levels. At the community level, mean age at marriage for men and women, socio-economic profile of the community including proportion of household heads (HH) employed and HH education status. Furthermore, knowledge and attitudes towards HIV, religiosity, graduation rates, peer influence, and availability of health facilities in the community were considered. These are risk factors that have been found to be important in some studies including additional risk factors that are hypothesised to influence early age at first sex among adolescents.

5.2 Levels and Trends in Early Sexual Activity

The circumstances surrounding first sexual activity of the respondents are described in Table 12. At the time of the Wave 1 survey, 4,704 young adults responded to the first sexual activity questions, with 2, 114 males and 2,590 females. In terms of sexual experience, 45.6% of males and 46.1% of females were sexually experienced at baseline, with the difference not statistically significant and with a p-value of 0.79. Transition into sexual activity was observed during the follow-up with sexual experience reported at 95.4% for males and 93.3% for females by the time of the Wave 5 survey, with more males reporting sexual experience than females (p-value = 0.02).

Mean age at sexual debut at Wave 1 was reported to be 15.7 years for males and 16.6 years for females ($p<0.01$), suggesting that on average, males started sexual activity earlier than females. Throughout the follow-up, males consistently reported sexual experience at a younger age compared to females, with age at sexual debut increasing with time as the survey progressed. Male respondents had first sex encounter with partners who were on average younger, while females reported first sexual partners who were on average older. Table 12 reports on circumstances of first sex among the young adult sample.

Table 12: Circumstances of first sex among adolescents and young adults

	Wave 1 (2002) n=4 704			Wave 2 (2003/2004) n= 1 368			Wave 3(2005) n=3 426			Wave 4(2006) n=3291			Wave 5(2009) n=2823		
	Males n=2 114	Females n=2 590	*P-value*	Males n=623	Females n=745	*P-value*	Males n=1574	Females n=1852	*P-value*	Males n=1485	Females n=1806	*P-value*	Males n=1263	Females n=1560	*P-value*
Sexually experienced (%)	45.6	46.1	*0.79*	66.3	62.8	*0.18*	74	72.5	*0.32*	84	82.4	*0.23*	95.4	93.3	*0.02*
Age at sexual debut (mean)	15.7	16.6	*<0.01*	16.1	16.8	*<0.01*	16.6	17.6	*<0.01*	16.2	17.2	*<0.01*	18.3	20.2	*<0.01*
Age first sex partner (mean)	15.3	19.6	*<0.01*	15.7	19.5	*<0.01*				15.8	20.2	*<0.01*	18.5	22.8	*<0.01*
Willing first sex (%)	96.1	84.8	*<0.01*	84.8	60.1	*<0.01*	30.6	29.4	*<0.01*	97	85.4	*<0.01*	98	95	*0.41*
First sex with boyfriend or girlfriend (%)	81	93.2	*<0.01*	63.6	76.5	*<0.01*									
Protection against disease or pregnancy - first sex (%)	50.9	53.7	*0.21*				64.2	67.3	*0.15*	77.5	78.4	*0.60*			
Condom use at first sex (%)	88.9	75.3	*<0.01*												
Duration of first sexual relationship (mean months)	5.4	6.4	*<0.02*												
Early age at sexual debut (%)	21.7	9.5	*<0.01*	19.8	9.1	*<0.01*	13.3	4.4	*<0.01*	20.7	6.1	*<0.01*	8.1	0	*<0.01*

At the Wave 1 survey, sexually experienced males reported a mean age of 15.3 years for their sexual partners, while females reported an average of 19.6 years for their sexual partners. This implies that males were engaging in sexual relationships with younger partners, while females were engaging with slightly older partners. The gap in age of first sex partner was significantly different for males and females throughout the five surveys.

In terms of early sex, 21.7% of male and 9.5% of females respondents were classified to have experienced early sexual activity, a significant difference between males and females ($p<0.01$). The majority of respondents consented to first sex, with 96.1% of males and 84.8% of females at the Wave 1 survey. During Wave 5 survey, 98% of males, and 95% of females reported to have consented to their first sexual intercourse. Females were more likely to have first sex with their boyfriends at 93.2%, compared to males having sex with girlfriends at 81%, suggesting that casual relationships were more frequent in males than females. About 51% of males and 54% of females protected themselves against disease or pregnancy at first sex. Condoms were mainly used at first sex with 89% males and 75.3% females reporting condom use to protect from disease and unwanted pregnancy. Females were more likely to stay longer in their first sexual relationships with an average of 6.4 months compared to males at 5.4 months, as reported in Wave 1. In summary, many of the independent factors were significantly different between males and females, and further analyses were conducted stratified by gender.

5.3 Determinants of Early Sexual Activity

Because of the longitudinal nature of this data, young adults who were not sexually experienced at baseline were followed up to monitor those transitioning into sexual activity. These were further grouped according to WHO classification criteria for early sex using 15 years as a cut-off point. Young adults, who transitioned into sexual activity during follow-up,

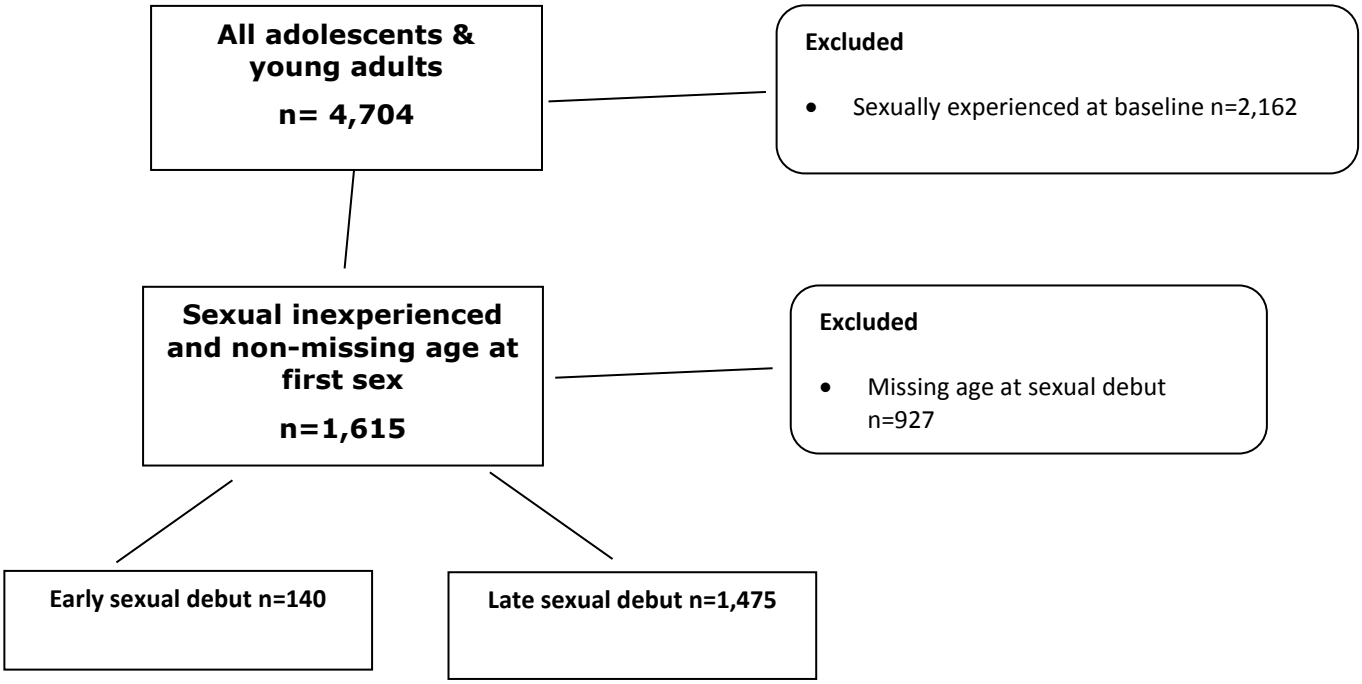
formed the analysis sample, using the baseline characteristics as the predisposing factors. Therefore, the control group was made up of adolescents and young adults who were not sexually experienced at baseline and either had no sexual experience during follow-up or transitioned into sexual activity after 15 years. The case group was made up of adolescents who were sexually inexperienced at baseline, and had sexual experienced during the follow-up period, before the age of 15 years.

Of the 4,704 adolescents and young adults responding to the young adult questionnaire during Wave 1 (2002), close to 2,162 (46%) reported sexual activity and were excluded from these analyses. Out of the 2,542 adolescents who were sexually inexperienced at baseline, about 1,712 (67.4%) transitioned into sexual activity by the Wave 5 (2009). No significant differences were observed between the proportion of males (68%) and females (67%) transitioning into sexual activity (p=0.42). Overall the mean age at sexual debut by follow-up end was 17.5 years (SD=2.5), with 16.8 years (SD=2.5) in males and 18.1 years (SD=2.4) in females.

Sexual transitions during follow-up were reportedly highest among Black African respondents, reporting 82% compared to 68% in Coloureds and 37% among the Whites. Those who were currently at school during the baseline survey were significantly less likely to transition into sexual activity with only 66% transitioning compared to 73% transitions for those not at school (p=0.01). Adolescents whose parents were never married were also more likely to transition into sexual activity during follow-up reporting at 76% compared to 65% whose parents were married (p=<0.01). No significant differences were observed in sexual transition for adolescents' expectations for employment or marrying in the next three years from baseline.

Of the 1,712 adolescents experienced sexual debut during follow-up, about 1,615 had non-missing age at first sex, and 140 (9%) reported early sexual debut as indicated on flowchart 1.

Flowchart 1: Flow chart of the analytical sample considered for early sexual debut



Early sexual debut significantly differed by gender, with 14% of males reporting early sex compared to 4% of females ($p<0.01$). A significantly higher proportion of Black Africans reported early sexual debut at 15% compared to Coloureds at 4.6% and Whites at 3.6% ($p<0.01$). Table 13 reports on sexual transition of the adolescent and young adult sample considered for analysis. During follow-up, the average age of sexual debut for males was 16.8 years (SD = 2.4) compared to females at 18 years (SD=2.3), a difference that was statistically significant with $p<0.01$ level.

Table 13: Bivariate associations for early sexual activity

Individual level variables	All young adults (n=4,704)	Sexually inexperienced at baseline (n=2,542)	Late Sexual Debut at follow-up (n=1,475)	Early Sexual Debut at follow-up (n=140)	P-Value*
Male sex, n (%)	2,114 (45)	1,147(45)	622(42)	103(74)	<0.01
Black Africans, n (%)	2,144 (46)	823(32)	548(37)	97(69)	<0.01
Years of education,(Mean, SD)	9.5(2.8)	9.0(2.7)	8.9(2.3)	7.7(1.9)	<0.01
Expects to pass Matric, n(% yes)	2,701(73)	1,727(81)	1,015(88)	110(90)	0.89
Worked in last 12 months, n (% yes)	1,316(28)	592(23)	318(22)	10(7)	<0.01
Expects to work in 3 years, n (%)	2,093(47)	1,060(44)	613(44)	26(20)	<0.01
Household level variables					
Number of siblings (Median, IQR)	2(1,3)	2(1,3)	2(1,3)	2(1,3)	0.39
Parents married, n (% yes)	3,527(76)	1,970(78)	1,103(75)	97(69)	0.11
Mother spend time with YA, n (%)	2,848(65)	1,700(71)	972(70)	89(69)	0.79
Father spends time with YA, n (%)	1,630(42)	1,066(48)	582(46)	48(40)	0.22
Brother /sister helps with study, n (%)	756(16)	454(18)	258(18)	30(21)	0.25
HH meals in a day (Mean, SD)	3.7(0.5)	3.8(0.4)	3.8(0.5)	3.8(0.4)	0.70
Influence on future job (Median, IQR)	1(1,3)	1(1,3)	1(1,3)	1(1,2)	0.20
Community level variables					
% HH Unemployed (Median, IQR)	16(8,30)	13(6,27)	15(9,27)	28(14,33)	<0.01
% HH female headed (Median, IQR)	40(32,45)	38(31,45)	40(32,45)	41(36,47)	0.02
%HH Informal dwelling (Median, IQR)	2(0,42)	1(0,4)	1(0,11)	11(1,48)	<0.01
% HH Africans (Median, IQR)	10(3,99)	4(2,99)	4(2,99)	99(9,99)	<0.01
Mean schooling years (Median, IQR)	8.9(8.4,10.0)	9.1(8.5,10.5)	8.8(8.4,9.8)	8.9(8.5,9.6)	0.58
% HH below Poverty (Median, IQR)	23(14,44)	18(6,34)	22(14,44)	44(22,48)	<0.01

** p<0.05, YA =young adult, HH = Household. Based on non-missing responses*

For early sexual debut, none of the risk factors considered at household level were found to be significant, while at community level, five out of the six risk factors assessed returned as significant. Sex of the respondent was very significant implying that males and females experienced different risk factors, and analyses were therefore conducted stratified by gender.

5.4 Multivariate Discriminant Function Analysis

Multivariate discriminant function analyses were conducted using selected variables of the young respondents separately for males and females. Means, and standardised discriminant scores, were reported in Table 14, providing univariate and multivariate results for factors discriminating against early and late sexual debut groups.

In males, results from the univariate analysis indicates that significant factors discriminating against early sex debut at individual level included; population group, years in education, age of first sex partner, and having worked in the last year. A higher proportion of the Black African population transitioned into early sexual activity, while having fewer years of schooling also discriminated against early sexual activity. Also, reporting a younger age of first sex partner, and not having worked in the last 12 months predicted early sexual debut.

At household level, no factor was significant for males, however, whether parents were married and when father was present at household, had a non-significant effect on early sexual debut. A higher proportion of males growing up families where parents were married or lived together reported delayed sexual activity and in cases when a father spent more time with the young male, they tended to report delayed sexual debut. At community level, all considered factors were significantly different between early and late sexual debutants. Many of the factors considered were proxy measures of community socio-economic status of education levels, proportion of household heads employed, and income levels. Young males from communities with higher poverty levels, more female headed households, a higher proportion of informal dwellings, a higher proportion of Black Africans, and more households living below the poverty line tended to report increased levels of early sexual activity. In summary, low socio-economic status of a community had the effect of increasing the proportion of young male adults engaging in early sexual activity.

Table 14: Standardised discriminant function coefficients for early sexual debut

	MALES					FEMALES				
Independent Variables	Late Sexual Debut	Early Sexual Debut	F-Value	P-value	LDA*	Late Sexual Debut	Early Sexual Debut	F-Value	P-value	LDA*
Individual										
Population group (% African Black)	32	70	55.4	<0.01		40	68	10.9	<0.01	
Years of education (mean years, SD)	8.62 (2.45)	7.66 (2.00)	14.1	<0.01	0.19	9.12 (2.30)	7.78 (1.76)	12.1	<0.01	-0.35
Currently in school (% Yes)	80	77	0.35	0.54		83	86	0.37	0.54	
Plans to pass Matric first time (% Yes)	91	92	0.04	0.84		94	96	0.46	0.49	
Age of first sex partner (Mean years, SD)	17.0 (2.73)	13.4 (2.37)	123.5	<0.01	-0.96	20.8 (3.75)	17.7 (3.31)	19.5	<0.01	-0.65
Worked in the last 12 months (% Yes)	26	8	14.9	<0.01		18	2	5.9	0.01	
Religious (% Yes)	30	21	3.2	0.07		37	31	0.5	0.45	
Household										
Number of siblings (Mean, SD)	2.04 (1.5)	2.20 (1.7)	0.9	0.32		2.14 (1.6)	2.48 (2.0)	1.48	0.22	
Parents married (% Yes)	78	70	2.92	0.08		73	65	1.22	0.26	
Mother spends time with young adult	5.10 (2.2)	4.86 (2.2)	0.96	0.32		5.19(2.1)	5.88 (1.6)	3.55	0.05	-0.32
Father spends time with young adult	3.96(2.4)	3.45 (2.6)	3.15	0.07		3.64(2.5)	3.60(2.5)	0.01	0.92	
Siblings help with homework (% Yes)	16	22	2.45	0.11		18	18	0.01	0.95	
Meals in a day in the household (Mean, SD)	3.81 (0.5)	3.83 (0.5)	0.05	0.81		3.81(0.4)	3.83(0.4)	0.08	0.77	
Most influence on future job (Mean, SD)	2.29 (2.6)	2.43(2.5)	0.25	0.61		2.32(2.5)	1.89(2.0)	1.07	0.29	
Community										
% HH Unemployed (Mean)	16	25	44.8	<0.01	-0.51	18	23	6.13	0.01	-0.87
% HH headed by females (Mean)	39	42	8.08	<0.01	-0.13	40	41	0.07	0.77	
%HH in Informal dwelling (Mean)	13	27	24.24	<0.01	-0.25	16	26	4.38	0.04	
% HH Individuals Africans (Mean)	34	71	60.96	<0.01	0.24	41	68	12.05	<0.01	0.99
% HH below Poverty Line (Mean)	25	38	52.75	<0.01	0.68	27	35	7.74	0.01	0.06

** Discriminant function coefficient for the multivariate model*

For females, individual level factors discriminating early sexual debut in the univariate analysis included; population group, years of education, age of first sex partner, and having worked in the last year. A higher proportion of females from the Black African ethnic group reported early sexual debut as compared to their White or Coloured counterparts. Also, having fewer years of schooling had an effect of an increased proportion reporting early sexual activity, and having a younger first sex partner. In addition, a smaller proportion of those engaging in early sex had worked in the last year compared to those delaying sexual activity. At the household level, only time spent with a mother had a significant effect, where increasing time spent with the mother had the effect of increased reporting of early sexual activity. At community level, proportion of household heads unemployed, living in informal dwellings, proportion of the households below poverty level, and proportion of households classified as Black Africans, had significant effect on early sexual activity. Even though community level factors were not strong determinants of early sexual activity, findings point to young females from lower socio-economic communities reporting increased levels of early sexual activity.

In males, nine risk factors were significant in the univariate analysis, and were entered into the multivariate models. Only seven of the risk factors were found to significantly contribute to the group classification accounting for 80% of observed variability. Age of first sex partner and years in education were important at individual level, and proportion of unemployed household heads, proportion living in informal dwellings, proportion of households headed by females, households with more Black Africans, and families living below the poverty line were major determinants at community level.

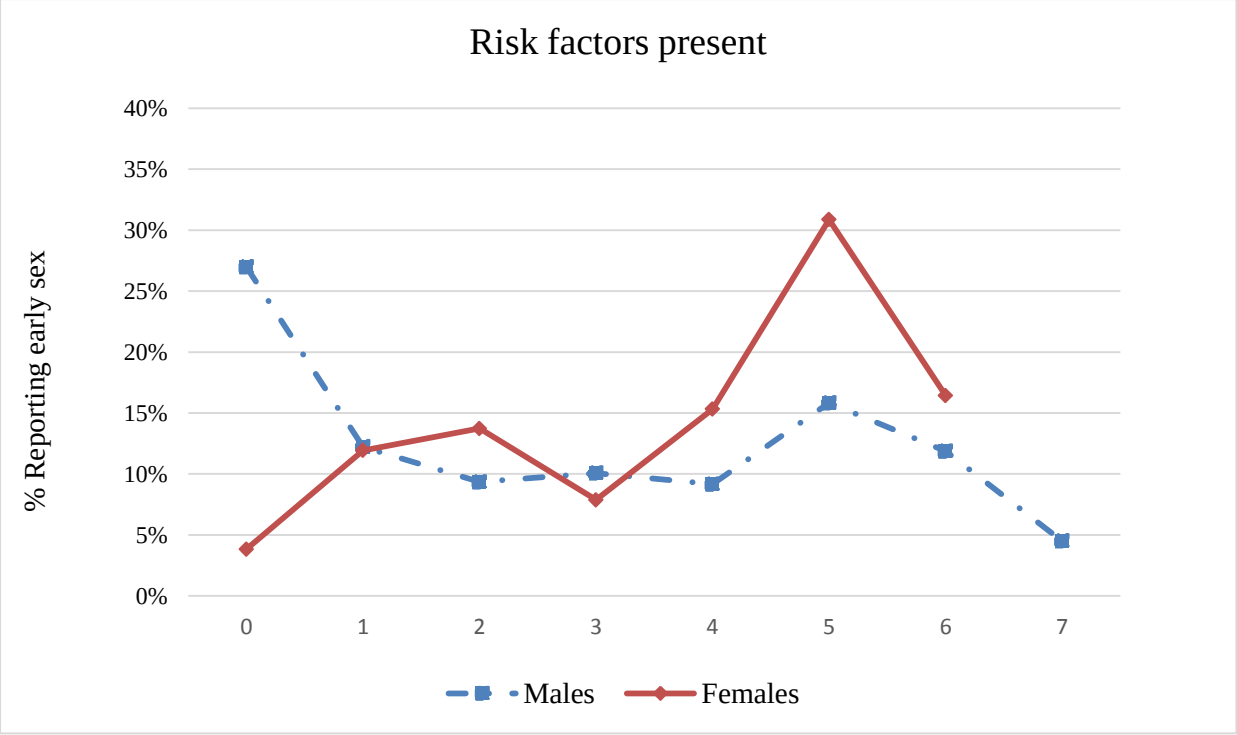
For females, ten risk factors were significant at the univariate level, and were therefore entered into the multivariate model. Six risk factors were found to be significant in the

multivariate model to significantly discriminate against the group classification of the outcome, and accounted for 95% of the variability in observed outcomes. Significant factors at the individual level included age of first sex partner and years of education, while at the household level, a mother spending time with the young adult was a significant factor. At the community level, proportion of unemployed household heads, proportion of households with Black Africans, and proportion of households below poverty line were important determinants.

5.5 Cumulative Risk Factor Analysis

All significant factors from the LDA analysis were used in the construction of a cumulative risk index. Risk factors were scored as either 0 (if risk was absent) or 1 (if risk was present) using meaningful cut-off points considered for the risk. Cumulative risk indices were generated by summing scores generated from risk factors identified for each young adult.

Figure 13: Number of risk factors present by proportion of respondents and gender

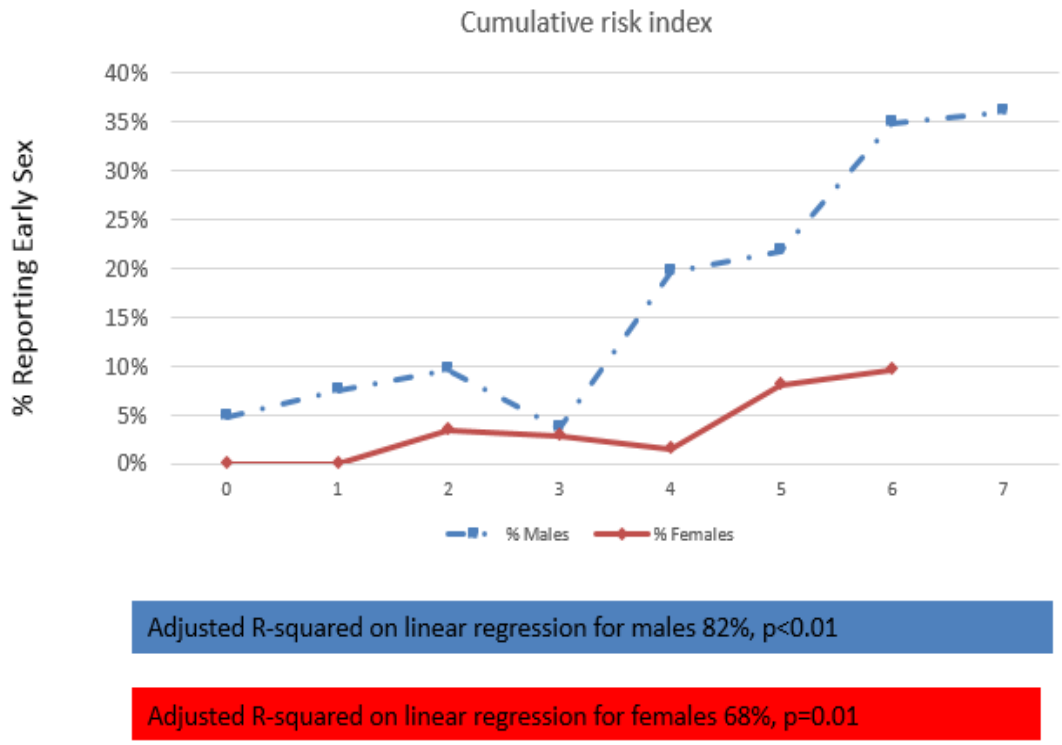


Proportions reporting early sexual debut at follow-up were plotted against cumulative risk indices. Figure 13 shows the distribution of risk factors against the proportion of adolescents and young adults reporting early sexual debut by gender. Males reported a maximum of seven risk factors compared to females reporting a maximum of six risk factors that significantly predicted their group classification. More males compared to females were likely to have no risk factors present with up to 27% of males reporting no risk factors compared to only 4% in females.

For males, the most frequent risk factors were proportion of household heads unemployed followed by proportion of households headed by females. For females, the most frequently occurring risk factors included fewer years of education, age of first sex partner, and spending time with the mother. It therefore shows that for females, individual and household level factors might be more pre-disposing when compared to males whose community level factors might be more important in determining first sexual activity. Figure 14 shows the relationship between number of risk factors reported and proportion of adolescents reporting early sexual debut. There was a distinct linear relationship between early sexual debut and number of risk factors reported in the ecology for both males and females.

The adjusted R-squared on linear regression for the proportion reporting early sexual debut and number of risk factors present for males was 82% and was statistically significant ($p<0.01$). For females, the adjusted R-squared for the linear relationship between the proportion reporting early sexual debut and the number of present risk factors was 68% and was also statistically significant ($p=0.01$).

Figure 14: Cumulative risk factor index by gender



This implies that increasing risk factors in the ecology of the young adult strongly predicted increased risk of reporting early sexual debut for both males and females.

For males, having 4, 5, 6 and 7 risk factors had the effect of 20%, 22%, 35%, and 36% respondents reporting early sex debut, implying that increasing risk factors increased the proportion of young males reporting early sexual debut. Similar findings were observed for females where having 4, 5, and 6 risk factors had an effect of 1%, 8%, and 10% reporting early sexual activity. In summary, for both males and females increasing risk factors had the effect of increasing the proportion of young adults reporting early sexual activity.

5.6 Discussion

This study finds that a high proportion of adolescents were initiating sexual activity at an early age. Researchers from other countries within Sub-Saharan Africa have argued that early sexual activities may differ between males and females, findings that were also confirmed by

the current study (Gyan, 2013; McGrath et al., 2009). The study also found that indicators of early sexual debut in South Africa differ by race, education levels, and socio-economic status of the communities where adolescents develop. These findings have also been previously reported in studies conducted in South Africa and other developed countries (Cunningham & Boult, 1996; Dinkelman et al., 2008).

Adopting a cumulative risk factor approach seemed practical in the context of South Africa as results demonstrated a positive linear relationship between increasing numbers of risk factors present in an adolescent's ecology and proportions reporting early sexual debut. In addition, significant risk factors appear at multiple levels of the ecology, indicating that risk factors are present not only at the individual level, but also at the household and community levels as hypothesised in this study. Assuming that risk factors occurred in the ecology and act in a cumulative manner has a number of implications for both policy and practice in South Africa. Firstly, interventions aimed at delaying sexual debut should target multiple factors within the ecology. Addressing causes of risky sexual behaviours among adolescents should not only intervene at individual level but also at household and community level as factors emanating from these levels have been shown to influence early age at sexual debut. Secondly, key messages of safe sexual practices should be disseminated at early learning institutions as being in school and peer influence has been demonstrated to be an important determinant. Evidence from this study indicates that education had tangible benefits in many ways: with the potential to delay sexual debut, and influence economic outcomes, where meaningful employment had an effect of delaying sexual debut.

This study was significant in many ways, as it was the first study in South Africa to apply a cumulative risk approach, investigating ecological risk factors for early age at sexual debut. Aspects of early sex debut have important implications on sexual and reproductive health

outcomes for adolescents and young adults, that impact on aspects of demography. Findings of mean ages at sexual debut and proportions reporting early sex for males and females are relevant in designing effective programmes that aim to delay sexual activity. Risk of HIV infection has been reported to be high for young women starts sex early as they are not equipped with skills to negotiate for safe sex practices(Rutenberg et al., 2003). These findings had some limitations as these data miss important indicators of peer influence, which might explain findings of early sexual activity in a schooling context. In addition, studies of sexual behaviours such as timing of first sex may be prone to social desirability bias that may distort responses.

5.7 Conclusion

These analyses show that a high proportion of adolescents were initiating early into sexua activity. In addition, a cumulative risk factor approach was found to be an applicable and a meaningful tool to study determinants of early sexual activity among adolescents and young adults in urban South Africa. Findings from this study provide strong evidence that as risk factors increase the likelihood of adolescents and young adults engaging in early sexual activities increased. Thus interventions for reducing occurrence of early sex initiation among adolescents and young adults should aim to reduce the number of risk factors that are present in the ecology. The presence of risk factors at multiple levels of the ecology suggests that interventions aimed at delaying early sexual debut should not only target the individual but also household and community levels. Furthermore, this study contributes to the field of demography and population studies, by analysing determinants of early age at first sex that impact on mortality and fertility outcomes especially for young women.

CHAPTER 6: DETERMINANTS OF MULTIPLE SEXUAL PARTNERSHIPS

6.0 Introduction

This chapter gives the results of investigating the ecological determinants of multiple sexual partnerships among adolescent and young adults in urban South Africa. Multiple sexual partnerships were defined as having more than one sexual partner in the last 12 months regardless of whether those were concurrent. In the young adults' questionnaire, the number of sexual partners in the last 12 months was reported in the CAPS survey as: "Number of sexual partners in the last 12 months". The question was repeated for the five waves of the survey and provided an opportunity to investigate on the contextual determinants of multiple sexual partnerships among the young adults in the course of follow-up. Since a number of respondents were already exercising multiple sexual partnerships at baseline, the outcome was restricted to:

1. Those not sexually active at baseline, transitioning into sexual activity during follow-up and reporting multiple sexual partnerships.
2. Those sexually active, only reporting single partners at baseline, and transitioned into multiple sexual partnerships during the follow-up.

Because data collected lacked a record of time-to-event information during follow-up, analyses were conducted using a case-control approach, where outcomes were defined at the end of the follow-up period. Outcome measures were defined for adolescents and young adults (14 years to 22 years) reporting multiple sexual partnerships in the last year. Therefore, two groups of comparison groups were formed; firstly, the respondents who were either sexually active reporting no multiple sexual partnerships from the time of baseline survey or those sexually inactive throughout the surveys constituted the controls. Secondly, cases were made from respondents who reported multiple sexual partnerships after the baseline surveys.

Risk factors were reported at individual, household, and community level. Statistical analyses and data manipulation were carried out in STATA 13 (StataCorp, 2013).

This chapter reports on the findings of investigating determinants of multiple sexual partnerships using a cumulative risk factor approach. It was argued that integrating factors at individual, household, and community level may be a strong predictor of early sexual debut than studying risk factors in isolation. Findings provides evidence on additional risk factors for MPPs among adolescents and young adults in South Africa, and whether a cumulative risk approach is practical for modelling risk factors of MSPs.

6.1 Dependent and Independent Variables

Reporting multiple sexual partnerships in the last year was the dependent variable and was defined as penetrative sexual intercourse with more than one partner in the last 12 months. For each wave of the survey, levels of MSPs were reported, and then disaggregated by gender. In the multivariate analysis, an outcome measure was defined to include adolescents and young adults that reported MSPs during the follow-up period. This excluded respondents who reported MSPs at baseline, and only included those reporting single partners, and those not sexually active at baseline, but transitioned into MSP during follow-up.

Risk factors that were examined appeared at individual, household, and community level. At individual level, factors reported included race, school achievements and aspirations, history of sexual abuse, marital status, employment, family size, ability to make personal decisions about health, and knowledge of HIV. At household level, risk factors included socio-economic status of the family, living with single or both parents, parental monitoring and supervision, closeness to the parents, and parents' education attainment. At community level, risk factors included mean age at marriage for men and women, socio-economic profile of the community including proportion of employed and education status of men and women.

Furthermore, knowledge and attitudes towards HIV, religiosity, graduation rates, peer influence, and availability of health facilities in the community were considered. These were risk factors that had been found to be important in other studies and additional risk factors that were hypothesised to influence MSPs among adolescents and young adults.

6.2 Levels and Trends in Multiple Sexual Partnerships

At the time of Wave 1 survey, of the 2,130 adolescents and young adults reporting sexual experience at the first survey, about 29% reported MSPs in the last 12 months. By gender, about 50% of sexually active males reported MSP, compared to only 18% in females. The median number of sexual partners in the last year for males was 1 IQR (1, 2), and 1 IQR (1, 1) for females, the difference was statistically significant with a p-value <0.01 implying that males reported higher sexual partners compared to females.

During Wave 2 of the survey, a smaller sample was used and the indicator for sexual partners in the last year was not reported, but an indicator for sexual partners in respondent lifetime was reported. For males, 50% reported MSP in their lifetimes, compared to 43% among females. The median number of lifetime sexual partners at Wave 2 was reported to be 2 IQR (1, 3) for males, and 1 IQR (1, 2) for females. The difference was statistically significant (p=0.04), implying that males again reported a higher number of lifetime sexual partners. At the time of Wave 3 survey, an indicator for multiple sexual partnerships in the last year was reported, and helped inform the trends. A maximum of 10 sexual partners were reported by the young adults in the last year at Wave 3 of the survey. Males reported a median of 1 IQR (1, 2) and females 1 IQR (1, 1). Overall, 18% of the respondents reported MSP in the last year, with 28% of the males, and 8% of the females reporting positively to having MSP in the last year. The difference between males and females was significant with a p-value < 0.01.

During Wave 4, a maximum of 11 sexual partners were reported in the last year, males had a median of 1 IQR (1, 2) compared to females with 1 IQR (1, 1). Overall, 23% of the respondents reported MSP at Wave 4, with 38% of males reporting MSP compared to 12% of females. The gender difference in MSP was again significantly different between males and females with a higher proportion of males reporting MSP.

At Wave 5 of the survey, a maximum of 20 sexual partners was reported among males, and a maximum of five among females. The median number of sexual partners for males was 1 IQR (1, 2), and also 1 (1, 1) for females. Overall, 20% of the young adults reported MSP at Wave 5 of the survey. A significant difference between males and females with 33% reporting MSP compared to only 9% for males and females respectively. Levels of MSP among young adults remained high during the waves of the survey and were especially high in males. Males had a maximum of 50% of the respondents reporting MSP over the surveys, and 19% was the highest for females. Table 15 shows the trends in multiple sexual partnerships in the last year and lifetime experience as reported by the young adults.

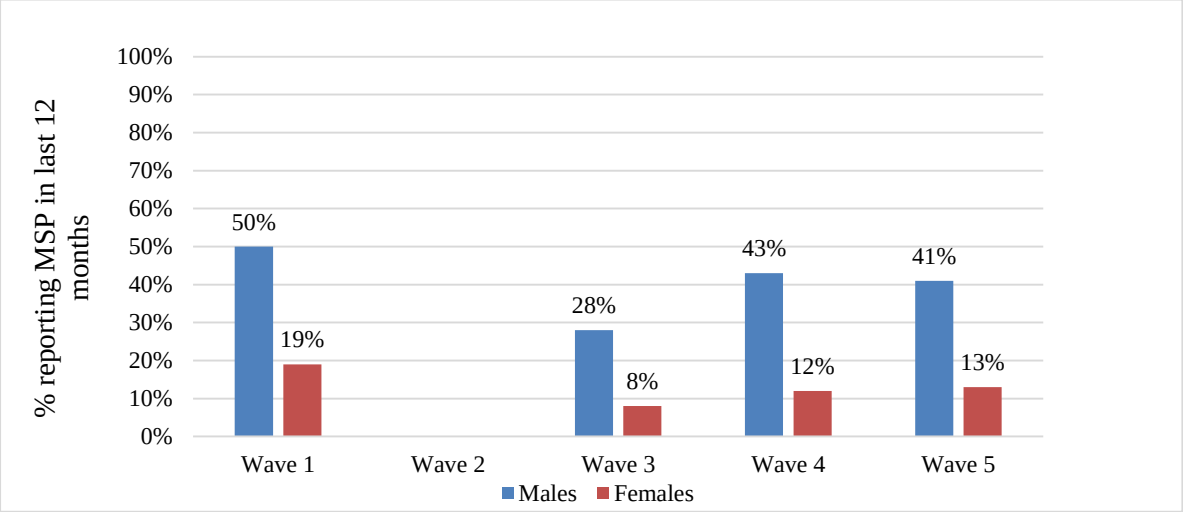
Table 15: Reported levels of MSP in the last 12 months by gender

Males	Wave 1 (n=2,114)	Wave 2 (n=623)	Wave 3 (n=1574)	Wave 4 (n=1,485)	Wave 5 (n=1,263)
MSP in the last 12 months (n, %)*	401(50%)	n/r	265(28%)	398(43%)	415(41%)
Lifetime MSP experience *	692(77%)	267(77%)	780(77%)	769(74%)	793(72%)
Females	Wave 1 (n=2590)	Wave 2 (n=745)	Wave 3 (n=1,852)	Wave 4 (n=1,806)	Wave 5 (n=1,560)
MSP in last 12 months (n, %)	198(19%)	n/r	89(8%)	150(12%)	162(13%)
Lifetime MSP experience (n, %)	766(68%)	303(73%)	871(70%)	896(66%)	926(67%)

** % based on non-missing responses, n/r not reporting*

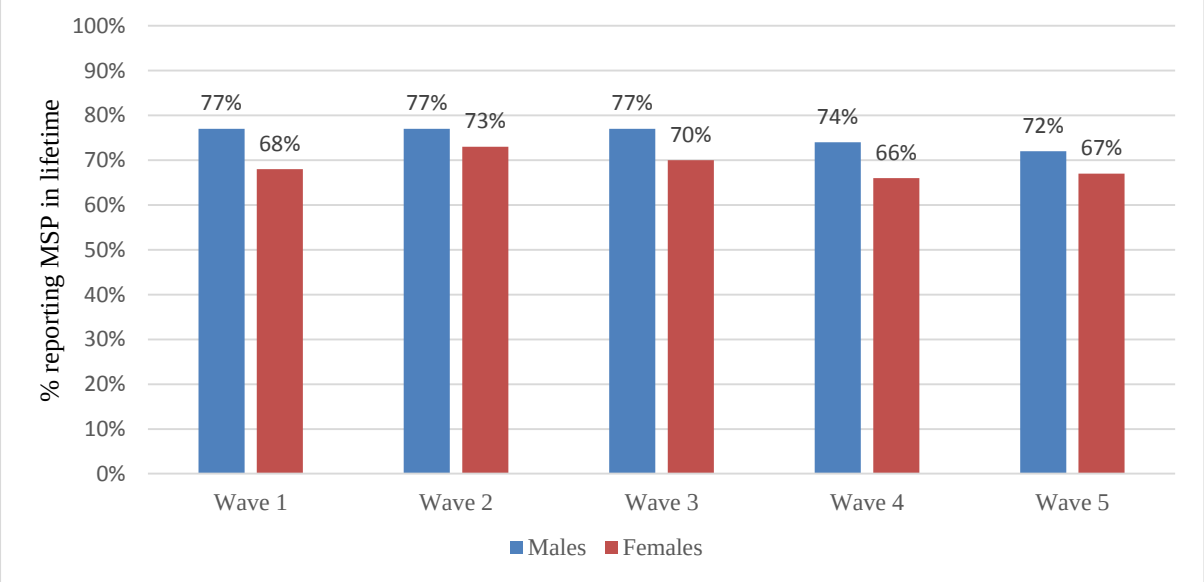
At baseline, more respondents reported MSPs, compared to follow-up surveys. At Wave 1 (2002), 50% of males reported MSP, compared to 41% Wave 5 (2009), while 19% of females reported MSP in 2002 compared to 13% in 2009 as demonstrated on Figure 15.

Figure 15: Percentage reporting MSP in the last 12 months by gender



The proportion of respondents reporting lifetime MSP is displayed in Figure 16. Females consistently report a lower percentage of MSPs both in the last 12 months, and over lifetime.

Figure 16: Percentage reporting lifetime MSP

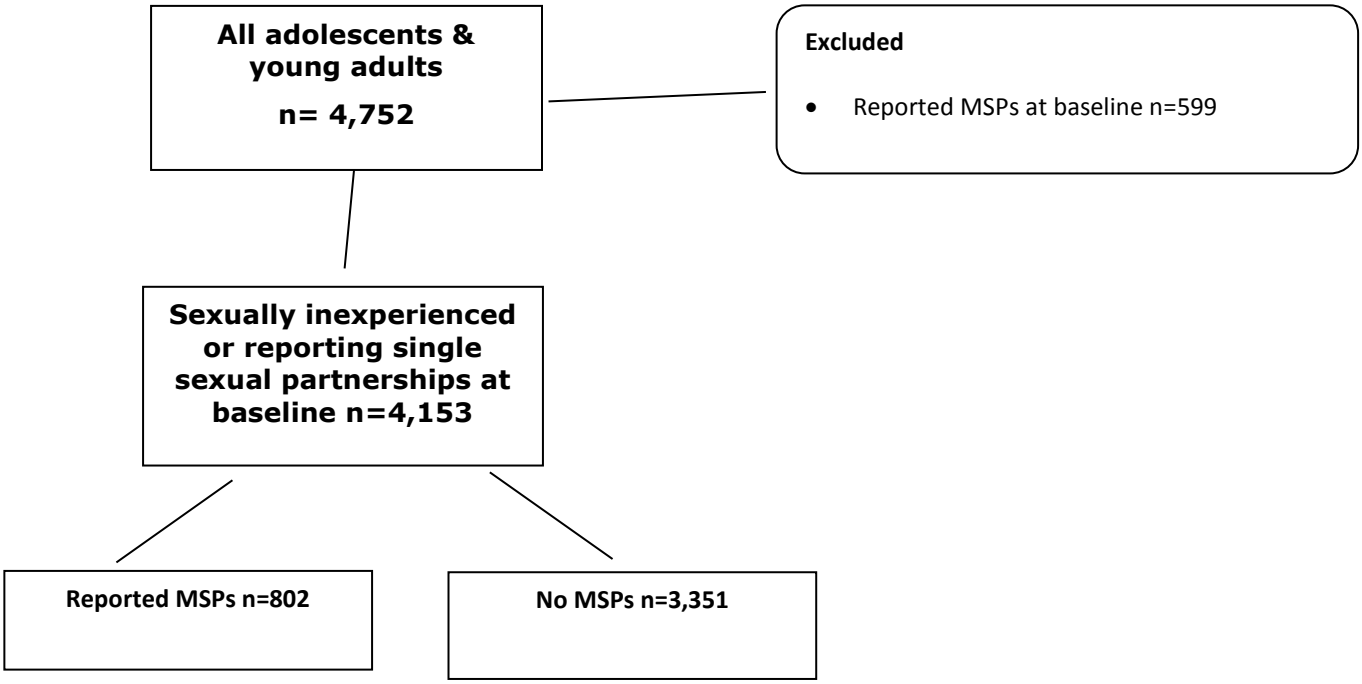


6.3 Determinants of Multiple Sexual Partnerships

Of the 4,572 respondents considered for analyses, 599 adolescents and young adults were both sexually active and reported MSPs at baseline and were excluded from further analysis.

Furthermore, 1,611 respondents reported sexual activity with single partners while another 2,542 had no sexual experience at baseline.

Flowchart 2: Flow chart of the analytical sample considered for multiple sexual partnerships



In total, 4,153 young adults were eligible for follow-up to investigate their transition into sexual risky behaviours for MSPs. By the time of Wave 5 of the survey, 802 young adults had ever experienced multiple sexual partnerships in follow-up, representing 20% of the respondents. More males had experienced MSPs with 31% reporting, compared to females at 12%, a statistically significant difference ($p < 0.01$).

Bivariate associations between experiencing MSPs and independent factors were reported as appearing on Table 16. Findings at the bivariate level indicate that significant factors appeared at the three levels of the ecology, with most of the community factors being significantly different between young adults reporting MSP versus those not reporting. Males had more significant risk factors present compared to females, with 21 out of the 25 investigated showing significant differences for males reporting MSP versus those not

reporting. In females, 13 out of the 25 risk factors investigated returned as different between females reporting MSPS and those not reporting MSPs. Table 16 show factors that were significantly different between MSP and non-MSP reporting adolescents and young adults.

Table 16: Bivariate associations for multiple sexual partnerships

	MALES			FEMALES		
Individual	No MSP	Yes MSP	P-value	No MSP	Yes MSP	P-value
Population Group* (n, %)			*<0.01*			*<0.01*
Black /African	348 (52)	324(48)		881(82)	191(18)	
Coloured	617(77)	185(23)		988(94)	64(6)	
White	244(92)	21(8)		273(94)	17(6)	
Religious (n, %Yes)	320(27)	125(24)	*0.21*	652(31)	85(31)	*0.80*
Age at first sex (mean)	16.9	15.9	*<0.01*	17.5	16.7	*<0.01*
Years in Education (mean years)	9.2	8.7	*<0.01*	9.9	9.2	*<0.01*
Plans to pass (n, % Yes)	712(93)	388(92)	*0.71*	1 202(92)	338(91)	*0.76*
Age of first sex partner (mean)	16.9	15.6	*<0.01*	20.5	19.9	*0.06*
Age expects a first child (mean)	27.3	27.0	*0.15*	26.3	26.3	*0.55*
Knows someone with HIV (n, % yes)	118(10)	71(14)	*0.03*	329(16)	47(18)	*0.39*
Knows someone died HIV (n, %yes)	169(14)	111(21)	*<0.01*	468(22)	86(32)	*0.11*
Chances of work in 3 years **	3.3	2.9	*<0.01*	3.30	2.9	*<0.01*
Worked in the last year (n, % Yes)	442(37)	111(29)	*<0.01*	572(27)	37(14)	*<0.01*
Household						
Number of siblings (mean)	2	3	*<0.01*	2	3	*<0.01*
Parents married (n, % Yes)	960(81)	394(75)	*<0.01*	1 603(76)	190(71)	*0.10*
Mother a HH member (n, % Yes)	250(81)	139(81)	*0.91*	597(82)	57(79)	*0.53*
Father a HH member (n, % Yes)	410(73)	189(63)	*<0.01*	841(71)	105(70)	*0.90*
Mother education (mean years)	10.4	8.9	*<0.01*	9.1	8.7	*0.91*
Father education (mean years)	10.8	8.9	*<0.01*	9.7	9.6	*0.86*
Meals in a day in the HH (mean)	6.1	5.8	*0.01*	5.7	5.9	*0.08*
Community						
% HH Unemployed (mean %)	15	23	*<0.01*	18	25	*<0.01*
% HH headed by females (mean %)	38	42	*<0.01*	39	44	*<0.01*
%HH in Informal dwelling (mean %)	13	24	*<0.01*	18	28	*<0.01*
% HH Individuals Africans (mean %)	31	62	*<0.01*	42	71	*<0.01*
Mean HH incomes	80 000	43 000	*<0.01*	65 000	62 000	*<0.01*
Mean years of schooling (mean %)	9.8	9.2	*<0.01*	9.5	9.2	*0.17*
% Households below poverty line (mean %)	23	33	*<0.01*	28	37	*<0.01*

*** Scale from 1 (low) to 5 (high)*

In males, individual level risk factors that were significantly associated with reports of MSP included coming from the Black African ethnic group, reporting a lower age at first sex,

reporting relatively fewer years of schooling, a younger aged sex partner, knowing someone who was living or had died from HIV, and those perceiving themselves as having little chances of working in the period. Neither religion, nor plans to pass matric, was associated with MSP. At familial level, significant factors were having more siblings, parents who were not married when the young male was born, where a father was mostly not a household member, less educated parents, and where households on average had fewer meals per day. The only non-significant factor at the household level was whether a mother was present in the household. At community level, all factors investigated were found to be significantly different between young males reporting MSPs versus those not reporting MSPs. Significant factors indicated that males reporting MSPs mostly lived in households with more unemployed household heads, with a higher proportion of female headed households, with a slightly higher percentage of households living in informal settings, households in suburbs where Black Africans formed majority of residents, in communities with significantly less household incomes, and with fewer years of schooling for the heads of households.

For females, significant factors at the individual level included coming from the Black African ethnic group, lower age at first sex, relatively fewer years of schooling, and reduced prospects of working in the period. At the familial level, only number of siblings was associated, implying that having more siblings was positively associated with MSPs. At the community level, most of the risk factors were again significantly different between females reporting MSPs and those not reporting MSPs. Significant risk factors included living in communities with a higher proportion of unemployed household heads, a higher proportion of households headed by females, a slightly higher percentage living in informal settings, mostly in suburbs where Black Africans were residing, and in households with significantly less income.

In conclusion, for both males and females, age at first sex and the age of first sexual partners were major factors associated with MSPs at the individual level with young adults starting sex earlier more likely to report MSPs. Also, the prospects of work and having worked in the period show a significant influence on MSPs. Respondents who were currently working or had the hopes of working in the coming years were less likely to report MSPs. At the familial level, having fewer siblings and having a present father were associated with fewer reports of MSPs. While many of the community level factors were proxy for community economic status, these factors were significantly different between young adults practising MSPs and those not practising MSPs, and accounted for much of the observed variability.

6.4 Multivariate Discriminant Function Analysis

Multivariate discriminant function analyses were conducted for the adolescents and young adults separately for males and females. The means, and standardised discriminant scores, with associated p-values are reported in Table 17. These reported on significant univariate and multivariate discriminant functions findings that explained the variation in MSP at follow-up. Risk factors were considered at individual, household, and community level and were analysed separately for males and females.

Results from the univariate analysis indicate that in males, significant factors at the individual level included; population group, years in education, age of first sex, age of first sex partner, knowing a person who died of HIV, and having worked in the last year. Being of African ethnicity had a significant effect on reporting multiple sexual partnerships in the follow-up. Also, a higher proportion of young males with relatively fewer years of schooling reported MSPs, as did males who experienced early sexual activities. In the context of South Africa, fewer years of schooling may correspond to not completing basic primary education, which takes about nine years of schooling. Knowing someone who died from an HIV/AIDS related

illnesses was also related to reporting MSPs. It was likely that respondents aware of a person living or suffering from HIV and AIDS were in neighbourhoods with a higher exposure to risky sexual behaviours where HIV was likely more prevalent. Finally, working within the last 12 months was protective against MSPs as young adults were potentially occupied. These factors were further investigated in a multivariate model and only age of first sex partner, and knowing someone who had died of HIV/AIDS at the individual level were significant in the final model.

At household level, numbers of siblings, parents ever married, father a household member, years of parent schooling, and meals in a day that were significant at the univariate level. Having a higher number of brothers and sisters was related to reporting MSPs at follow-up. Young males who grew up in families where parents were not married were more likely to report MSPs, while young males reporting least MSPs were likely growing up in households where a father was present. Both parents' education levels determined a young male report of MSPs, but an increasing number of schooling years for both mother and father were related to a decrease in reports of MSPs. These factors were entered into the multivariate model, and only parental marital status at birth, a present father in the household, and years of father's schooling were selected in the final model.

All community factors considered at the univariate level were to be significantly different, including proportion of household heads unemployed, proportion of households headed by females, proportion of households in informal dwellings, proportion of households with Africans, mean annual household income, and proportion of households below poverty level in the community. Many of the community level factors may indicate proxy measures of the community socio-economic status and highly correlated.

Table 17: Standardised discriminant function coefficients for multiple partnerships

	MALES					FEMALES				
Independent Variables	No MSP	Yes MSP	F-Value	P-value*	LF**	No MSP	Yes MSP	F-Value	P-value*	LF**
Individual										
Population group (% Black)	29	61	100.1	<0.01		41	70	37.4	<0.01	
Years of Education (Mean, SD)	9.21	8.71	6.77	<0.01		9.78	9.16	5.66	<0.01	0.18
Plans to pass Matric (% Yes)	93	92	0.73	0.48		91	91	0.06	0.93	
Age of first sex (Mean, SD)	16.9(2.4)	15.9(1.8)	28.5	<0.01		17.5(2.2)	16.7(1.7)	15.6	<0.01	
Age of first sex partner (Mean, SD)	16.9(2.8)	15.5(4.4)	15.9	<0.01	- 0.42	20.5(4.1)	19.9(3.0)	2.78	0.06	
Knows someone with HIV (% Yes)	10	13	2.84	0.06		15	17	2.78	0.06	
Knows person died of HIV (% Yes)	14	21	7.01	<0.01	-0.17	22	32	9.60	<0.01	-0.15
Worked in last 12 months (% Yes)	37	29	22.7	<0.01		27	14	11.2	<0.01	
Religious (% Yes)	27	24	1.2	0.29		30	31	2.3	0.09	
Household										
Number of siblings (Mean, SD)	2(1)	2.5(2)	12.1	<0.01		2.0(2)	2.5(2)	7.2	<0.01	0.05
Parents married (% Yes)	81	75	4.0	0.01	0.16	76	71	4.1	0.01	
Mother a household member (% Yes)	80	81	0.31	0.73		82	79	1.65	0.19	
Father a household member (% Yes)	72	62	5.86	<0.01	0.16	71	70	0.76	0.46	
Years of mother's schooling (Mean)	10.35	8.92	3.54	0.03		9.13	8.65	2.14	0.11	
Years of father's schooling (Mean)	10.83	8.87	4.95	<0.01	0.25	9.65	9.62	0.25	0.77	
Meals in a day in the HH (Mean)	6.11	5.83	4.46	0.01		5.75	5.94	2.73	0.07	
Community										
% HH Unemployed (Mean %)	14.8	22.8	82.5	<0.01		18.1	24.9	39.2	<0.01	
% HH headed by females (Mean)	37.5	41.4	21.1	<0.01		38.8	43.7	21.3	<0.01	0.27
%HH in Informal dwelling (Mean)	12.7	23.7	30.9	<0.01	-0.42	17.8	28.2	17.4	<0.01	
% HH Individuals African (Mean)	30.3	61.4	95.4	<0.01	1.37	41.2	70.5	53.2	<0.01	-1.22
Mean annual HH income (Mean)	79 500	43 100	46.4	<0.01		64 900	41 300	16.1	<0.01	
% HH below Poverty Line (Mean)	23.4	33.6	66.8	<0.01	0.69	27.5	36.4	32.5	<0.01	0.67

** P-value for univariate analysis <0.05, ** Discriminant function coefficient for multivariate model*

Male respondents from communities reporting lower household head employment rates, a higher proportion of female headed households, and from communities with a higher proportion of informal dwellings had higher reports of MSPs. Further, male respondents from communities with a higher proportion of Black African individuals, a lower mean household income, and a higher proportion below the poverty line had higher reports of MSP at follow-up. However, in the final multivariate model, only proportion of households in informal dwellings, proportion of households with Black African individuals, and proportion of households below the poverty line were significant at the community level.

For females, individual level factors discriminating MSPs in the univariate models included population group, years of education, age at first sex, knowing someone who had died of HIV AIDS, and having worked in the last 12 months. Female respondents from Black African ethnic group had higher reports of MSPs as well as those with fewer years of schooling. In the case of South Africa, fewer years of schooling correspond to not completing basic primary education, which requires nine years to complete. Females knowing someone who died from HIV and AIDS also reported higher MSPs, and indication that they came from families and communities, which could be exposed to risky sexual behaviours including MSPs. The prospects of working, and having worked in the last 12 months were observed to be protective against MSPs. This may be explained by either having employment may imply a source of income that could mitigate against engaging in sexual relationships that may be transactional or working likely kept females occupied to initiate MPPs. In the multivariate analysis, only years of education and knowing a person who had died of HIV were selected in the final model.

At the household level, only the number of siblings, and parents ever married were significant in the univariate model. Having more brothers and sisters had a significant effect on reports

of MSP and could be potentially explained by messages and influence on sexuality from trusted relatives. Also, growing up in families where parents were never married had the effect of increased reports of multiple partnerships among young females. In the multivariate analysis, only the number of siblings was selected in the final model.

At the community level, all factors considered were significant at the univariate level, including proportion of household heads unemployed, proportion of households headed by females, proportion of households living in informal dwellings, proportion of households with African Blacks, and mean household income. These factors were mainly proxy indicators of socio-economic status of the community, as were highly correlated. Female respondents from communities reporting lower household head employment rates, more women as heads of households, had higher reports of MSP. Again, female respondents from communities with more informal dwellings, more Black African individuals, lower mean household incomes, and more households below poverty line had higher reports of MSP at follow-up. However, only the proportion of households headed by females, and the proportion of individuals identified as African Blacks were significant in the final multivariate models

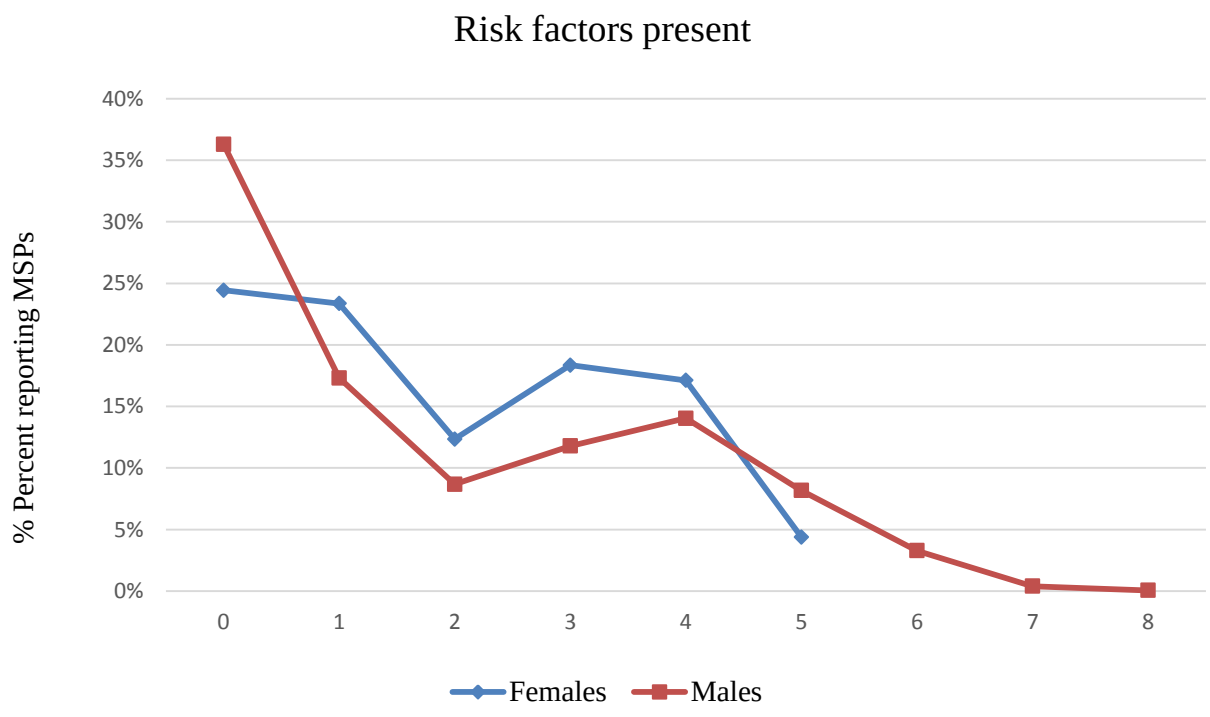
All significant factors at the three levels of the ecology were included in a multivariate discriminant function analysis, and their relative contribution to explaining MSP investigated. Table 17 reports on the findings from the multivariate model with all significant factors at univariate level. Many of the factors were correlated, with some of the individual level factors found to be part of the community level factors; therefore some of the highly correlated factors were excluded from the final model analysed. For males, community level proportion of Black Africans was excluded as it was correlated to the population group reported at the individual level. At community level, poverty line, mean household income,

and proportion of household heads unemployed were highly correlated and only the poverty level indicator was retained in the final model. For females, the community level proportion of African individuals was correlated with population group at individual level and was therefore dropped, and at the community level poverty line, mean household income, and proportion of household heads unemployed were highly correlated and only the poverty line indicator was retained.

6.5 Cumulative Risk Analysis

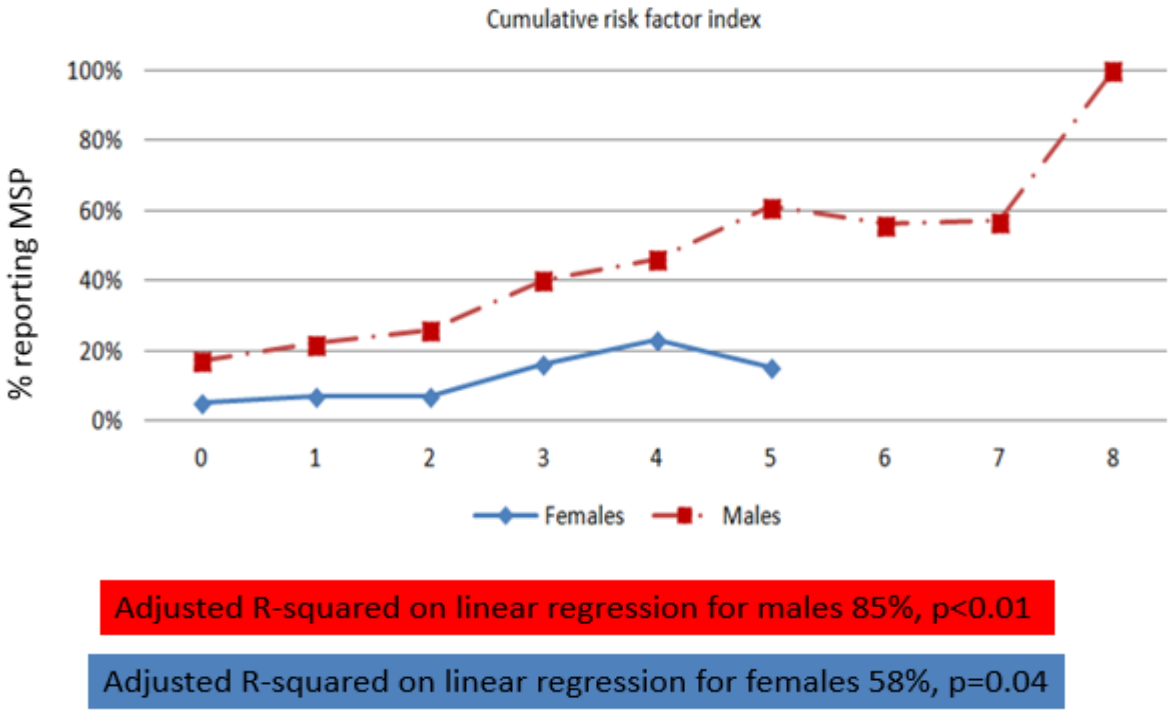
All significant factors from the LDA analysis were used in the construction of a cumulative risk index. Risk factors were scored as either 0 (if risk was absent) or 1 (if risk was present) using meaningful cut-off points considered for the risk. Cumulative risk indices were generated by summing the scores generated from the risk factors identified for each of the young adults. Proportions reporting multiple sexual partnerships at follow-up were plotted against the cumulative risk indices as shown in Figure 17.

Figure 17: Risk factors present for multiple sexual partnerships



Males had more cumulative risk, with a small proportion reporting up to eight risk factors, compared to females who only had a maximum of five factors present. Figure 18 shows that as more risk factors become present in a young adult's life, the higher the proportion reporting multiple sexual partnerships.

Figure 18: Percentage reporting multiple sexual partnerships against significant risk factors



The presence of cumulative risks shows a distinct increment in the proportion reporting MSPs. For males, the presence of 2, 3, 4, 5, 6, 7, and 8 ecological risk factors was respectively associated with 26%, 40%, 46%, 61%, 56%, 57%, and 100% respectively reporting multiple sexual partnerships. In females, the presence of 2, 3, 4, and 5 ecological risk factors was associated with 7%, 16%, 23%, and 15% respectively reporting multiple sexual partnerships. The finding that multiple partnerships increases with more risk factors present in the ecology are important for South Africa and other sub-Saharan African countries facing a high HIV prevalence among young adults. To change sexual behaviours of

multiple partnerships and reverse the HIV trend, interventions should be aimed at multiple levels of the ecology as risk factors occur at various levels, and act cumulatively.

6.6 Discussion

This chapter finds that at Wave 1 of the survey, a high proportion of adolescents and young adults were engaging in multiple sexual partnerships, both in the last year and lifetime. Previous research in Southern Africa reported high levels of multiple partnerships, suggesting that these partnerships differ among males and females, these findings were also confirmed in the current study. For the entire duration of the follow-up surveys, males consistently reported a higher level of multiple and concurrent partnerships. This is even though a higher number of respondents reported MSP at Wave 1 (2002) survey compared to Wave 5 (2009) survey for both males and females. Similar trends have been observed in other research reports in South Africa where AIDS mortality peaked in 2009 and a major scale-up of behaviour change messages, and HIV counselling and testing may have resulted in change of risky sexual behaviours. Therefore, findings of a decline in the level of MSP over time of follow-up are documented in other research studies and may be attributed to a change in behaviour due to government interventions for safe sexual practices to discourage multiple sexual partnerships.

Determinants for MSP over follow-up indicate that risk factors appear at various levels of the ecology. Community level factors were especially significant in predicting MSP, as the majority of the community risk factors investigated returned as significant for both males and females. African Black ethnicity had the effect of a higher proportion reporting MSP, a result that may be driven by gender roles and cultural activities that permit MSP in the context where Black African respondents live(Strebel et al., 2006). The practice of MSP is common in African Black communities where female respondents expect men to have steady partners

whom they love, and a girlfriend or a secret lover whom they meet secretly for sexual activity (Onoya et al., 2015). Men in these communities have additional relationships for sexual satisfaction, driven by peer pressure, and the cultural belief that men are inclined to naturally have more than one sexual partner(Furstenberg, 1987). For both females and males, ethnicity was a significant factor for MSP. Education levels and expectations of progressing further with learning were also significant factors for both males and females. It was unclear if being at schools presented adolescents with the opportunity to learn about HIV and risky sexual behaviours, but respondents in schools and expecting to pursue a higher education reported the least levels of MSP. Also, a younger age at the onset of sexual activities had an effect of increased MSP for both males and females in the course of follow-up, findings that have also been reported in other research reports (R. Rector, Johnson, A.K.,Martin, S., Lauren, R.N., 2003). In an analysis of the National Survey of Family and Growth, the study reported linkages between early sexual activity and the number of non-marital sexual partners, with a greater number of partners in the course of lifetime (Copen, 2016). Knowing someone who had died of HIV/AIDS was also a significant factor for both males and females, with a higher proportion of respondents knowing someone who had died from AIDS also reporting MSP in the last year. Several studies have found no correlation between HIV knowledge and a reduction in risk taking behaviours. Previous studies have reported that even among adolescents who are aware of HIV transmission modes lacked the ability to translate this knowledge into risk aversion behaviours (Moyo et al., 2008).

At household level, having parents who were never married to each other, a father who was mostly absent and less educated parents were significant factors for MSP in males. This might be the case where males take strict instructions from their fathers, compared to their mothers, and may result in significant differences in sexual behaviours if fathers are present. Historically, fathers in South Africa were mostly absent to work in the mines, and the

paternal absence has been linked to adolescent distress and risky sexual behaviours. Fathers have been associated with teaching coping skills to their children even in studies in developed countries, which in turn are related to adolescent sexual risk taking behaviours. Therefore, higher levels of MSP among male respondents with absent fathers can be linked to other traits of children with absent fathers.

At community level, most of the risk factors reported were found to be significant. For both males and females, living in communities with a higher proportion of unemployed household heads had an effect of higher reports of MSP and these findings have also been reported before (MacPherson et al., 2012). Community level indicators may be proxy for socio-economic status, and clearly respondents hailing from poor backgrounds were more likely to report MSPs. For females, coming from poor households may promote transactional sexual relationships, where they are supplied with material items in exchange for sexual relationships away from their main sexual partner. Transactional sexual relationships are particularly important drivers of new HIV infections in sub-Saharan Africa with many studies documenting huge age gaps for men and women involved. Therefore, negotiating for safe sex practices in transactional relationships has been a persistent issue.

In this study, applying a cumulative risk factor approach seems practical with results demonstrating a positive linear relationship between number of risk factors present in the ecology and the proportion reporting MSP. This study finds that as more risk factors become present in the adolescents' lives, the higher the proportion of those reporting MSP. Therefore, adopting a cumulative risk factor model to study ecological risk factors for MSP was practical and provided a powerful tool for the investigation. This finding is new for South Africa and further research needs to be directed into quantifying the cumulative effect of

ecological risk factors. This would inform design of interventions that consider all factors that mitigate the effect of cumulative risk.

Research has converged to the critical role sexual partnerships networks plays in STIs and HIV transmission dynamics arguing that sexual networks may explain why persons can have the same risk behaviour and yet some have increased risk of STIs infections. HIV and AIDS contribute to increased mortality to infected persons, and affects population sizes that are key to demographic theory. Increase in AIDS related mortality is associated with a decline in life expectancy, with mortality rates among children also being higher than they would be without HIV. Since AIDS-related deaths affect men more than women, this may lead to an alteration of the age and sex-structure. Besides, countries with a high prevalence of HIV experience increased mortality among the most productive age group between 15 and 45 years, thus lowering overall economic output.

6.7 Conclusion

The study analyses showed a high proportion of adolescents were engaging in MSP. In addition, it was found that a cumulative risk factor approach was a powerful tool to study multiple sexual partnerships among adolescents and young adults in urban South Africa. Findings from this study provide strong evidence that as risk factors increase in the ecology, the likelihood of young adults engaging in MSP increases. Thus interventions should aim to reduce the number of risk factors that are present in a young adult's ecology. The presence of risk factors in multiple levels of the ecology suggests that interventions aimed at eradicating MSP among adolescents and young adults should not only target the individual but also the household and community level risk factors.

CHAPTER 7: DETERMINANTS OF CONSISTENCY IN USE OF CONDOMS

7.0 Introduction

This chapter presents findings from investigating ecological determinants of consistency in condom use among adolescents and young adults in urban Cape Town. Consistency in condom use was defined as always using condoms in the last sex act and consistently during the study duration. Respondents were asked how often they used condoms with their last sex partner, with the CAPS survey asking: "How often do/did you use a condom with this last sex partner?" The expected responses were "Always", "Usually", "Sometimes", or "Rarely". Only participants responding "Always" in the various waves of the survey were coded to be consistent condom users, while the comparison group was defined for those selecting the "Usually", "Sometimes", and "Rarely" responses.

Research concludes that consistency in using condoms constitutes the single most realistic, effective, and reliable means of protecting against unwanted pregnancy, HIV and other sexually transmitted diseases in sexually active adolescents and young adults (Maticka-Tyndale, 2012). Unprotected sexual activities combined with low utilisation of contraception are the topmost causes of disease and pregnancy among adolescents and young adults. Studies have reported a high level of unsafe sexual activity among South African adolescents (L. Eaton et al., 2003; MacPhail & Campbell, 2001). The South African National HIV Prevalence, Incidence and Behaviour Survey 2012, reported that over two-thirds (67.5%) of young men aged between 15 and 24 years used condoms at their last sexual encounter in 2012, down from 85.2% in 2008. Also, in men aged between 25 and 49 years, condom use fell from 44.1% to 36.1% over the same period. Overall, 52.9% of the survey participants were not consistently using condoms.

To improve the health and wellbeing of adolescents and young adults, it is important to understand why they engage in unprotected sex despite the proven benefits of condom use. Research points to low uptake of condoms in many countries of sub-Saharan Africa, with determinants of condom use appearing at individual, household, and community level factors (Maticka-Tyndale, 2012). However, risk factors have previously been considered in isolation, and no study reports on their cumulative effect on sexual behaviours of adolescents and young adults. This analysis investigates additional variables determining consistency in condom use that have not been previously reported in South Africa before, and tests a cumulative risk factor. Integrating a cumulative risk factor model into an ecological framework suggests that risk factors may appear at multiple levels of the adolescent's life or social ecology and that these factors may act cumulatively.

The longitudinal CAPS data were investigated for levels, trends and determinants of condom use among adolescents and young adults in urban Cape Town. Condom use and perception indicators were collected during the five waves of the surveys. Analyses were done separately for each gender due to existing differences observed in condom use between males and females. Inconsistency in condom use was generated, taking into account all the follow-up responses for condom use at last sex and during the period. Risk factors were reported at individual, household, and community level. Statistical analyses and data manipulation were carried out in STATA 13 (STATA Corp, College Station, TX). This chapter discusses the obtained results and the potential implications of these findings. Since a number of young adults were already sexually active and not consistently using condoms at baseline, the response variable was defined considering the following:

1. Sexually active adolescents and young adults who reported consistency in condom use at baseline and transitioned into sexual activity without using condoms in follow-up.

2. Adolescents and young adults who were not sexually active at baseline and transitioned into sexual activity, reporting inconsistency in condom use were added to the inconsistency group, while their counterparts contribute to the consistency group.

7.1 Dependent and Independent Variables

Independent variables that were examined appeared at individual, household, and community level. Individual level factors investigated included population group/ethnicity, school achievements and aspirations, history of sexual abuse, marital status, employment in the past years and perceptions of employment in coming years, family size, ability to make personal decisions on health, and knowledge of HIV. Household level risk factors reported included socio-economic status of the family, living with single or both parents, parental monitoring and supervision, closeness to the parents, parental education attainment, and whether parents were married at birth of the respondent. Community level risk factors looked mean age at marriage for men and women, socio-economic profile of the community including proportion of employed and education status of men and women, average annual income for households in the community, and proportion of households below the poverty line. Furthermore, knowledge and attitudes towards HIV, religiosity, graduation rates, peer influence, and availability of health facilities in the community were considered. These were a combination of risk factors that had been found to be important in other studies but in this study additional risk factors were also investigated.

7.2 Levels and Trends in Condom Use

During the time of Wave 1 of the survey, of the 1 121 sexually active adolescents and young adults, 911(81%) reported using condoms at the time of first sex. Male condoms were predominantly used compared to female condoms, with only three respondents reporting using female condoms. About 57% (1160) of those reporting last sex in Wave 1 used

condoms as a form of contraception. In Wave 1 of the survey, consistency in condom use with last sex partner, measured as always using condoms at last sex, was reported in 69% of the young adult respondents. Figure 19 reports on the levels and trends in consistency in use of condom with last sex partner over the three waves of the survey where the indicator was reported.

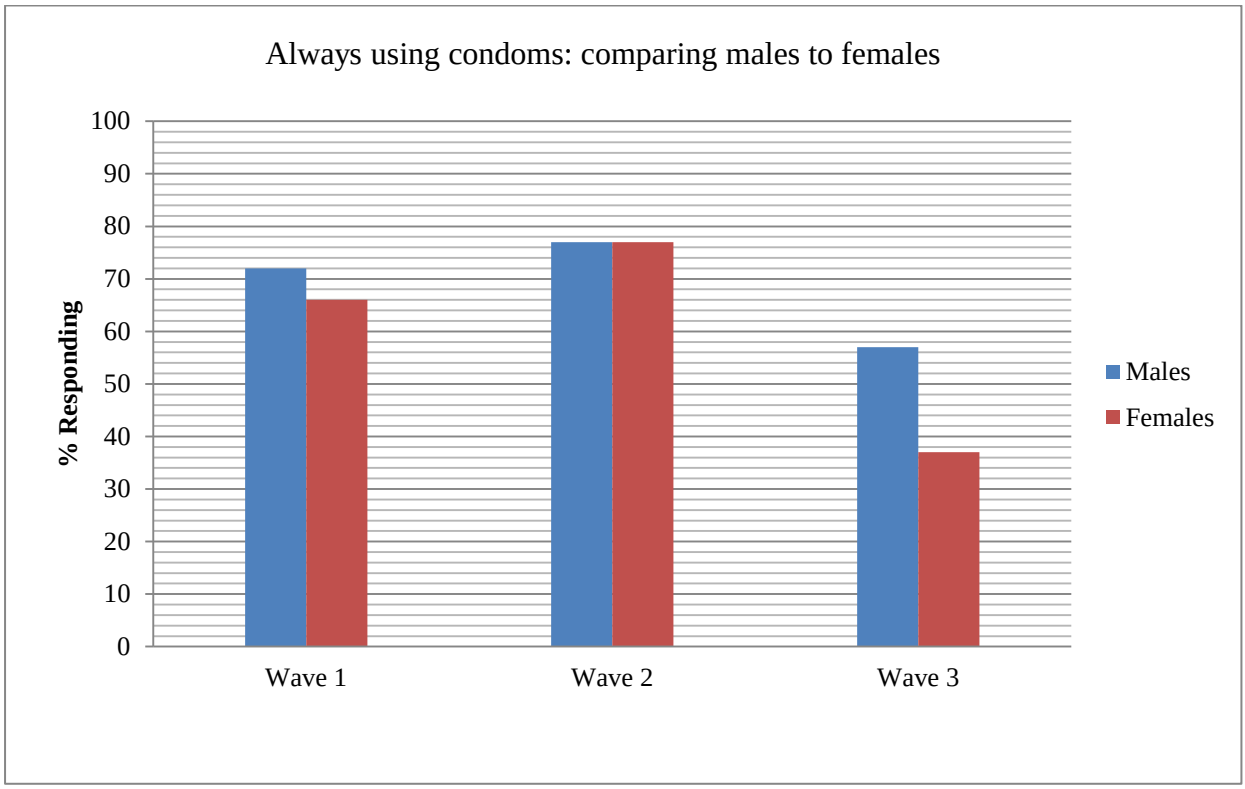
Figure 19: Consistency in condom use with last sex partner



During Wave 2 survey, about 77% reported always using condoms with last sex partner, and a marked drop was observed at Wave 3 with only 46% of the respondents reporting consistent condom use. Overall, the trend indicates an increase in consistency of condom use from Wave 1 to Wave 2, and then a decrease in the Wave 3 survey as indicated in Figure 19. Consistency in condom use at Wave 1 differed significantly between males and females, with 72% of males reporting always using condoms compared to 66% of females. No differences were noted at Wave 2, with an equal number of males and females reporting consistent condom use at 77%. However, more males than females reported consistency at Wave 3 with

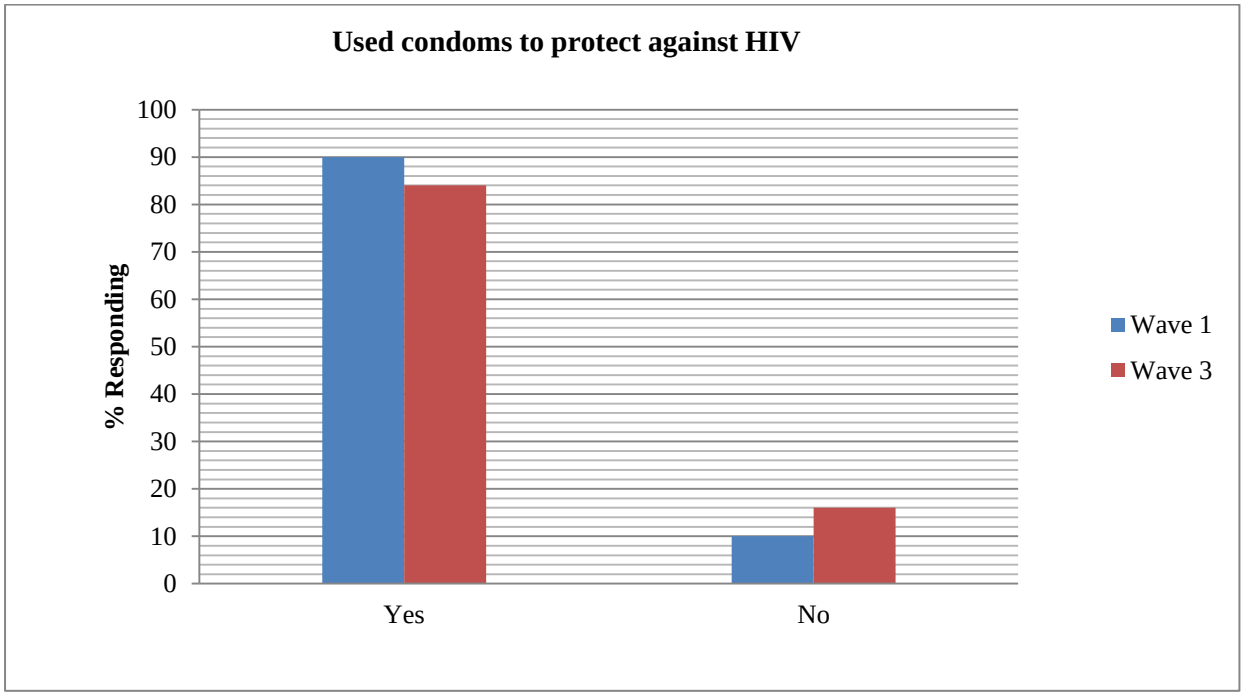
57% of males reporting always using condoms compared to 37% of females as Figure 20 shows.

Figure 20: Gender differences in consistency in condom use



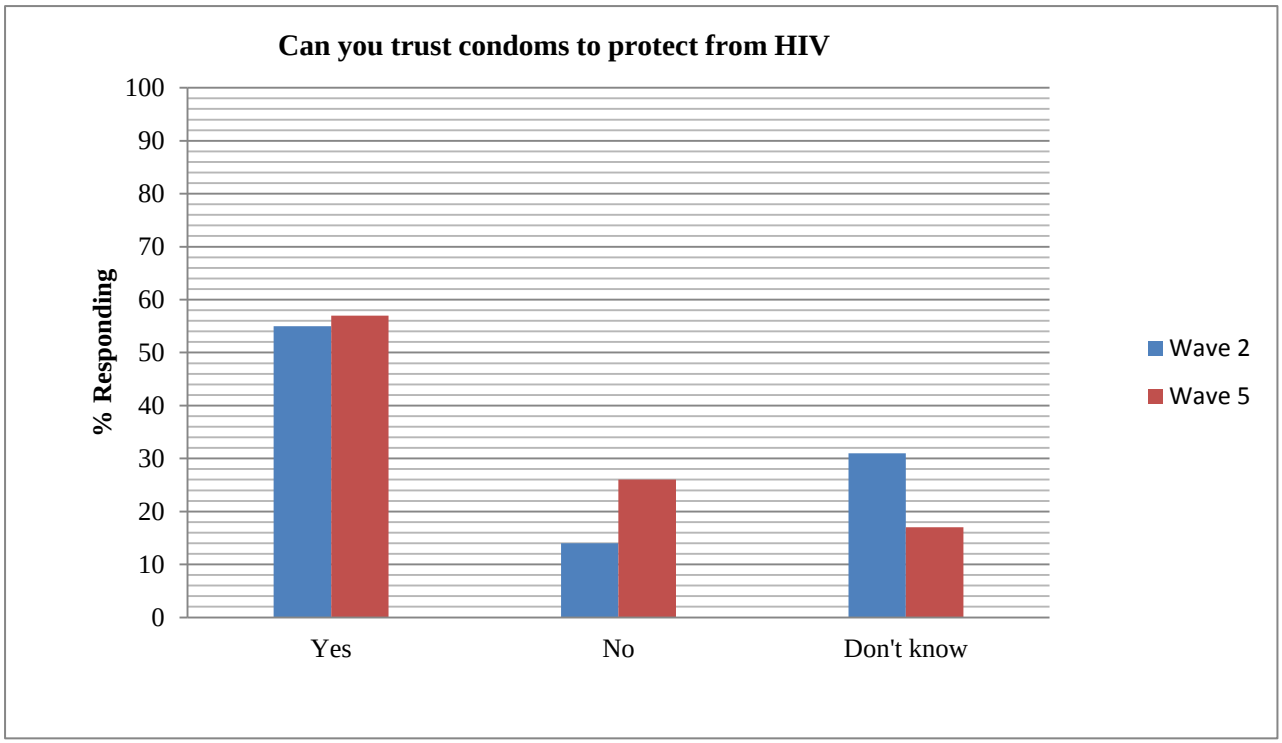
Of the 4 502 young adults responding to contraceptive use by Wave 1 survey, over 90% used condoms at last sex to protect themselves from HIV, with a similarly high proportion of 84% using condoms to protect themselves from HIV at the Wave 3 survey as seen in Figure 21

Figure 21: Reasons for using condoms at last sex



By Wave 2, 55% of the respondents believed that one could not get HIV while using condoms and 57% by Wave 5 had a similar belief, as reported in Figure 22.

Figure 22: Trust in condoms

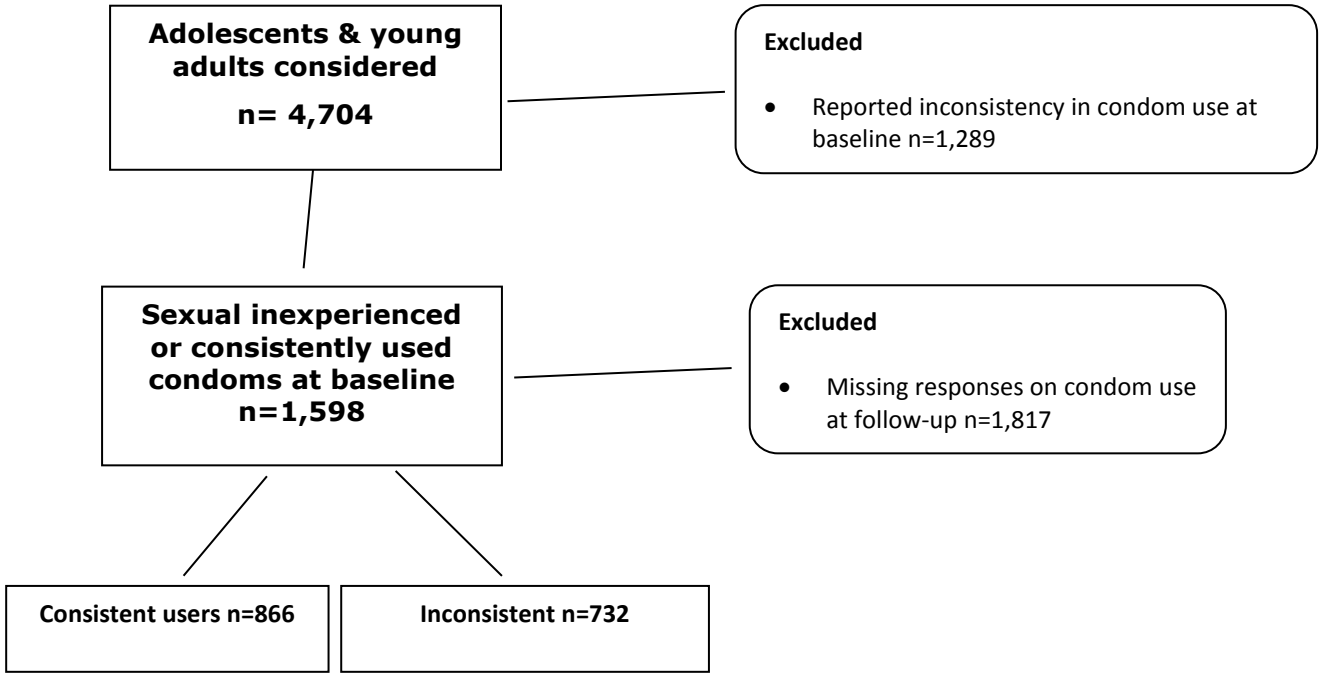


7.3 Determinants of Consistent Condom Use

Consistency in condom use during the follow-up period was defined for adolescents who reported always using condoms at baseline and changed to inconsistency during follow-up. In addition, adolescents and young adults not sexually active at baseline transitioning into non-marital sexual activities to report inconsistency in condom use. Therefore, two set of groups were defined; consistent and inconsistent groups with regard to condom use. These analyses focus on understanding these differences.

About 2 162 adolescents and young adults were sexually active and 1 289 (60%) reported inconsistency in use of condoms and were excluded from our analysis. At baseline, 2 542 respondents did not report any sexual activity, and 873 of those reporting sexual activity reported consistency in the use of condoms with their last sexual partners. Therefore, a total of 3 415 respondents were eligible for follow-up at baseline, to investigate their transition into sexual risky behaviours of inconsistency in use of condoms. Flowchart 3 indicates the definition of the analytical sample used in the study.

Flowchart 3: Analytical sample considered for consistency in condom use



Due to limited responses on condom use indicators, only the first three waves of the surveys captured data with condom use indicators and were used to define our outcome variable. Of the 3 415 consistent condom users and sexually inactive adolescents at baseline, 1 598 responded to condom use at follow-up, with 866 (54%) classified under consistent users while 732 (46%) were classified as inconsistent as indicated on flow chart 3.

Of the consistent users, males were significantly more likely to report at 62% compared to females at only 47%, a result that was significant at $p<0.01$. Consistency in condom use did not differ significantly between alcohol users and non-users, with 55% of alcohol users reporting consistency compared to 54% in non-alcoholics. Consistency in condom use differed as per the ethnicity of the adolescents, with a higher proportion of Whites reporting consistency at 69% compared to Black Africans at 57% and 48% of Coloureds.

Bivariate analyses were performed for individual, household, and community variables separately for males and females as reported in Table 18. In males, significant factors associated with consistency in condom use at individual level included age, where younger adolescents were more likely to consistently use condoms ($p<0.01$) with last sex partner. Also, adolescents currently enrolled in schools were more likely to consistently use condoms ($p=0.01$), and those expecting to marry in three years' time were less likely to always use condoms compared to their counterparts. At household level, adolescents and young adults whose parents had an increased number of years of education, whose parents were less likely to be married at birth, and whose parents were less likely to be household members, were more likely to consistently use condoms even though these differences were not statistically significant.

Table 18: Bivariate associations for consistency in use of condoms

MALES	Males			Females		
Independent Variables	Consistent	Inconsistent	P-value	Consistent	Inconsistent	P-Value
Individual						
Age (mean years)	17.54	18.27	<0.01	17.36	17.74	0.02
Educational Level (mean years)	9.29	9.18	0.56	9.58	9.66	0.64
Currently in school (n, %yes)	337(69)	174(59)	0.01	303(80)	292(67)	<0.01
Plan to pass matric first time (n, %yes)	298(81)	173(79)	0.45	249(94)	252(84)	<0.01
Population group n (%)			0.67			<0.01
Black/African	233(62)	145(38)		243(53)	217(47)	
Coloured	211(62)	132(38)		87(31)	196(69)	
White	43(67)	21(33)		49(70)	21(30)	
Knows someone with HIV (n, % yes)	57(12)	48(16)	0.07	81(21)	83(19)	0.39
Worked in the last 12 months (n, % yes)	131(27)	94(32)	0.16	74(20)	97(22)	0.32
Expects to have a job in 3 years**	3.07	3.23	0.12	2.98	3.22	0.01
Religiosity (n, % yes)	117(24)	58(19)	0.13	154(41)	136(32)	0.01
Alcohol Use	121(25)	89(30)	0.11	63(17)	62(14)	0.33
Expects to marry in 3 years (n, % yes)	13(3)	16(5)	0.05	9(2)	25(6)	0.02
Household						
Parents married (n, % yes)	354(73)	227(77)	0.22	259(69)	308(71)	0.45
Years of mother's education (mean)	9.5	8.6	0.38	9.7	8.5	0.05
Years of father's education	10.0	8.7	0.11	10.3	8.2	0.01
Brother/Sister helps with homework	422(87)	258(87)	0.9	83(22)	63(15)	0.01
Mother a household member (n, % yes)	358(74)	230(77)	0.25	259(68)	316(73)	0.16
Community						
% HH heads unemployed	19.3	21.1	0.04	22.4	21.3	0.24
% HH headed by females	39.9	40.7	0.16	41.2	41.4	0.90
% Individual Africans	47.7	49.9	0.47	63.5	50.5	<0.01
Mean HH income (ZAR)	58 000	50 000	0.07	55 000	48 000	0.70
Mean schooling years	9.4	9.2	0.04	9.5	9.1	<0.01

** Population group (1=black, 2=coloured, 3=white), ** a scale from 1 (low) to 5 (high)*

Community level factors included, proportion of household heads unemployed and community mean schooling years, which were significant. Respondents in communities with a higher proportion of unemployed households were less likely to consistently use condoms.

In communities with a higher mean education level, adolescents were more likely to report consistency in the use of condoms.

In females, findings on individual level factors indicate that younger adolescents reported a higher likelihood of using condoms. In addition, those currently enrolled in school and those planning on passing their Matric exams were more likely to consistently use condoms with their last sex partner. Also, a significantly higher proportion of Whites (70%) were consistently using condoms with their last sex partners compared to Black Africans (53%), and Coloureds (31%). Young female adults who were expecting to work in three years' time reported less consistency in use of condoms while females who reported that they belong to a religious group were more likely to consistently use condoms. Lastly, females who were expecting to be married in three years' time from the baseline survey were less likely to use condoms consistently. At the household level, a higher level of parental education for both father and mother was associated with a higher consistency in condom use among females. Also, having a sibling helping with homework was associated with increased consistency of using condoms, possibly pointing to the influence of siblings in providing information on risk taking behaviours. At community level, the proportion of individual Africans living in the community and the mean schooling years of the community was significant. Findings show that in communities with higher proportion of Black Africans, young females reported higher levels of consistency in condom use. Also, in communities with higher mean years of schooling, young females were more likely to consistently report using condoms with last sex partners.

In conclusion, results from the bivariate analysis show that for both males and females, age of the adolescent, currently enrolled in schools, and expecting to marry in the next three years, were major individual level factors associated with consistency in the use of condoms with

last sex partner. The ethnicity of the respondent was observed to be important for females but not for males. At familial level, no factors were found to be important for males, while in females, years of parents' education and having siblings who helped with homework, were found to be important. While many of the community level factors may be proxy for community socio-economic status, only the proportion of individual Africans and mean schooling years of the community were found to be important factors in female respondents. For males, household factors had little influence on condom use, while community and individual level factors appear to be more important. However, in females, factors appear at the three levels of the ecology.

7.4 Multivariate Discriminant Function Analysis

Multivariate discriminant function analyses were conducted for the young adult respondents. The means, and standardised discriminant scores, with associated p-values, were reported in Table 19. These assessed for univariate and multivariate discriminant functions that could explain the differences in young adults reporting consistency in the use of condoms at follow-up and were conducted separately for both males and females.

Results from the univariate analyses indicate that in males, four risk factors at individual level were significantly different between the outcome groups of consistency versus inconsistency. These included age of the respondent where those reporting always used condoms were relatively younger than those reporting inconsistency. Also a higher proportion of those reporting consistency were currently in school compared to those reporting inconsistency, while knowing someone with HIV had the effect of reporting inconsistency in the use of condoms. Finally, those reporting inconsistency were more likely to report expecting to marry in the next three years compared to their counterparts who were

not planning to marry, even though only a small proportion of young male adults were planning to get married.

At household level, results from the univariate analysis for males indicated that no risk factors were significantly different between young males reporting inconsistency and those always using condoms. At community level, only the proportion of unemployed household heads and mean schooling years of communities were significantly different for males. Communities with a higher number of household heads unemployed had the effect of young males reporting more inconsistency in the use of condoms compared to young males from communities with a slightly lower proportion of household heads unemployed. Again, communities with higher mean years of education had young males reporting consistency in condom use compared to communities with lower education years as shown in Table 19.

Table 19: Standardised discriminant function coefficients for consistency in use of condoms

	MALES					FEMALES				
Independent Variables	Consistent	Inconsistent	F-Value	P-value *	DA**	Consistent	Inconsistent	F-Value	P-value *	
Individual										
Age (mean years)	17.54	18.27	5.89	0.01	0.69	17.36	17.74	18.81	< 0.01	0.38
Currently in school (% Yes)	69	59	9.24	<0.01	-0.20	80	67	17.02	<0.01	
Plans to pass matric (% Yes)	89	89	0.01	0.91		97	89	13.36	<0.01	-0.46
Black African (% Yes)	48	48	0.30	0.57		64	50	1.74	0.18	
Knows someone with HIV (% Yes)	11	16	3.40	0.03		21	19	3.15	0.07	
Expects a job in 3 years (very high)	15	22	2.36	0.12		18	21	5.67	0.02	
Expects to marry in 3 years	3	5	3.81	0.05	0.19	2	6	5.92	0.01	
Alcohol use	25	30	2.50	0.11		16	14	0.91	0.33	
Religious (% Yes)	24	19	2.22	0.13		40	31	7.27	<0.01	
Household										
Parents married (% yes)	73	77	1.48	0.22		69	71	0.55	0.45	
Mother's education (Years, SD)	9.47	8.62	0.79	0.38		9.69	8.48	3.70	0.05	-0.42
Father's education (mean, SD)	10.04	8.71	2.54	0.11		10.33	8.22	6.37	0.01	
Siblings help with homework (%Yes)	13	13	0.01	0.97		21	14	7.53	<0.01	0.30
Mother a HH member (% Yes)	73	77	1.32	0.25		68	72	1.95	0.16	
Community										
% HH heads unemployed	19.3	21.1	3.79	0.05		22.4	21.3	1.62	0.20	
% HH headed by females	39.9	40.7	0.76	0.38		41.2	41.4	0.03	0.84	
% Individual Africans	47.7	49.9	0.42	0.51		63.5	50.5	15.56	<0.01	
Mean HH incomes (ZAR)	57 700	49 700	2.73	0.09		54 700	47 800	2.70	0.10	
Mean schooling years	9.4	9.2	5.68	0.01	-0.49	9.5	9.1	21	<0.01	-0.44

** P-value for univariate analysis, ** discriminant function coefficient for factors significant for the multivariate model*

Results from the univariate analysis for females indicate that individual level factors include age of the respondent, whether currently in school, planning to pass matric exams, expecting a job in three years, expecting to marry in three years, and being religious. Results show that younger females were more inclined to report always using condoms, as well as being currently in school, and planning to pass matric. Conversely, those who had higher expectation to work in the next three years were less likely to always use condoms compared to those not planning to work in three years. Also, a higher proportion of those who reported inconsistency were planning to marry in the near future compared to consistent condom using young females. Finally, a higher proportion of consistent condom users were religious compared to their inconsistent colleagues.

At household level, parental years of education, and having siblings who helped with homework, were significantly different between the outcome groups. Young females reporting consistency in condom use had parents who were much more educated on average compared to females reporting inconsistency. Also, having siblings who helped with homework had the effect of a higher proportion reporting consistency. At community level, the proportion of individual Africans in a community, and mean schooling years, were significantly different between the outcome groups. Communities with a higher proportion of Africans had the effect on young females that was more consistency in using condoms compared to their counterparts who came from communities with fewer African individuals. Finally, in communities with higher mean years of education, young females tended to report more consistency compared to their counterparts in communities with lower mean levels of education.

The second stage involved including all the significant risk factors in a full LDA multivariate model, and excluding risk factors if their contribution to explaining the variation were minimal.

Results from the multivariate discriminant function analyses demonstrate a number of significant risk factors that are important determinants of consistency in condom use among young adults. For males, the most parsimonious model from the multivariate analysis included three individual level factors and a single factor at community level, with no household level factor included. At individual level, age of the respondent, being currently in school, and expecting to marry in three years were significant, while at community level, only mean community schooling years was significant. As indicated in Table 19, younger respondents were more likely to report consistency in use of condoms with their last sex partners. For females, results from the multivariate model indicate that the most parsimonious model had risk factors from the three levels of the ecology. At individual level, age of the respondent and planning to pass matric exams were important risk factors. Mother's average years of schooling and having siblings who helped with homework were significant at household level. Only the mean community schooling years were significant at community level.

7.5 Results from Cumulative Risk Analysis

All significant factors obtained from the multivariate discriminant function analysis were used to construct a cumulative risk index. Risk factors were scored as either 0 (if risk was absent) or 1 (if risk was present) using meaningful cut-off points considered for the risk. Cumulative risk indices were generated by summing the scores generated from the risk factors identified for each of the young adults. Males had fewer risk factors reported with a total of four when compared to females who had five risk factors reported. Proportions reporting inconsistency in the use of condoms were plotted against the cumulative risk indices as indicated in Figure 23.

Figure 23: Risk factors present

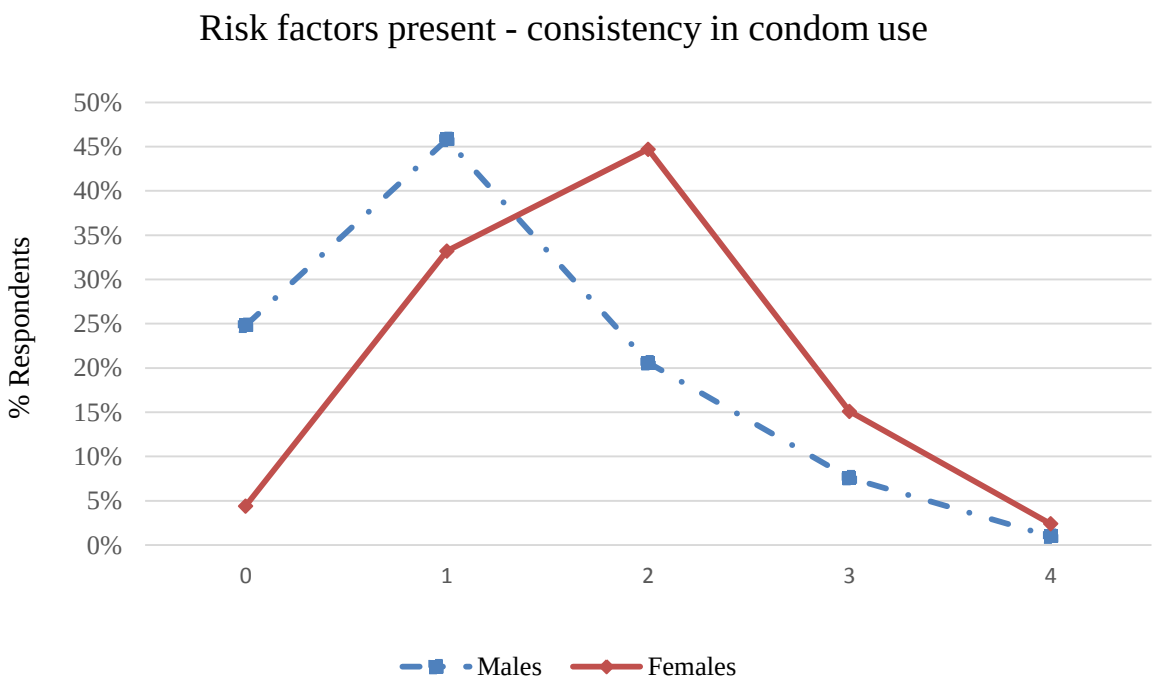


Figure 23 shows the distribution of risk factors among the respondents. For both males and females, a maximum of four risk factors were present. More males had absent risk factors at 25% of the analysis sample compared to females while only about 4% of females had no risk factors present. A higher proportion of females had at least two risk factors present compared to males with about 62% reporting two or more risk factors compared to males with only 29% reporting two or more risk factors present.

The cumulative risk index was plotted against the proportion reporting inconsistency in the use of condoms separately for males and females as shown in Figure 24. A very distinct linear relationship was observed for both males and females between the presence of risk factors and reporting inconsistency in the use of condoms.

Figure 24: Inconsistency in condom use against present risk factors

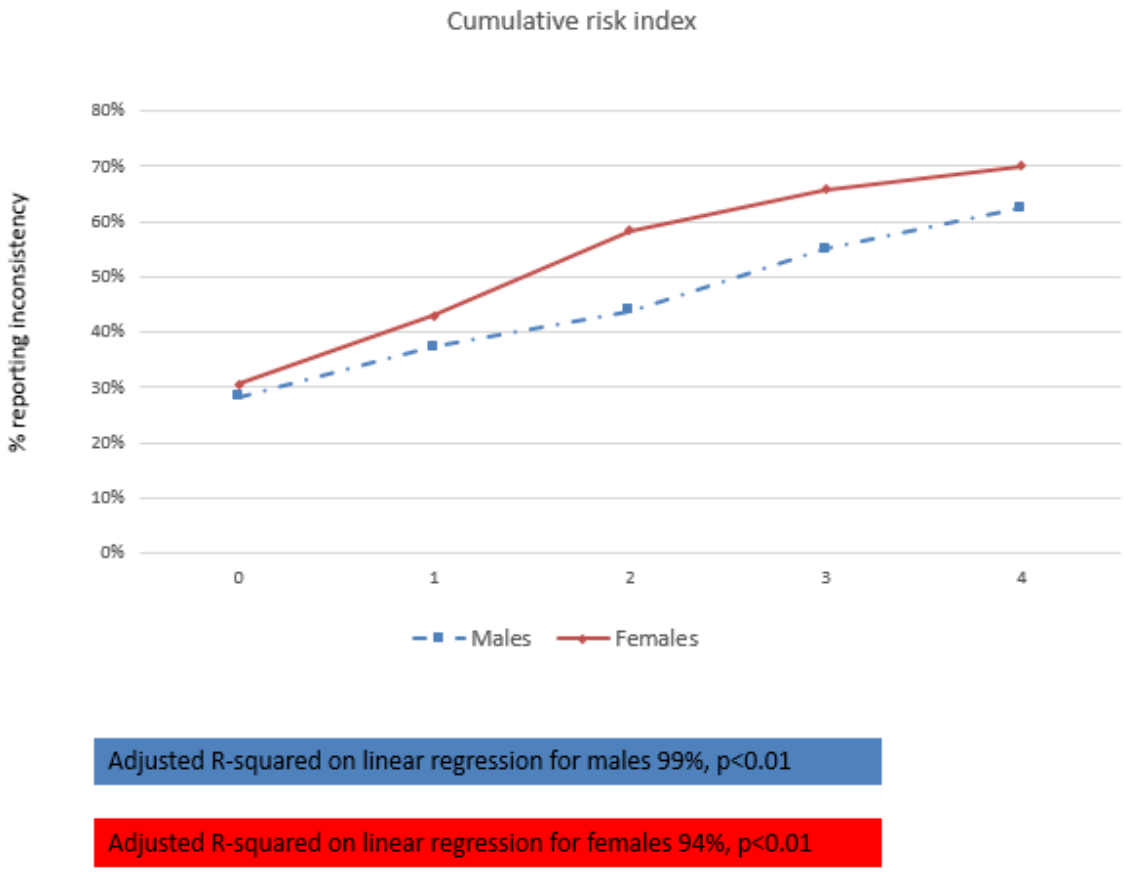


Figure 24 shows that as more risk factors become present in the lives of adolescents and young adults, the higher the proportion reporting inconsistency in condom use with their last sexual partners. This implies that risk factors act cumulatively to determine sexual risky behaviours of condom use at last sex. A simple linear regression was conducted between the proportion reporting inconsistency and the cumulative risk, and in males, the cumulative risk accounted for over 99% of the variability in the proportion reporting inconsistency. This finding was highly significant with a p-value<0.01. Similarly, for females, the cumulative risk accounted for over 94% of the variability that was also highly significant with a p-value<0.01. Therefore, these

findings confirm that as stipulated, increasing risk factors in the ecology of young adults correlates to increasing reports of inconsistency in the use of condoms.

These findings are important for South Africa and other countries facing a high HIV prevalence among young adults. To change adolescent sexual behaviours and reverse the HIV trend, interventions should be aimed at multiple levels of the ecology as risk factors occur at various levels, and act cumulatively to influence sexual behaviours.

7.6 Discussion

This study examined levels, trends, and determinants of consistency in the use of condoms among adolescents and young adults in urban Cape Town. Levels in the use of condoms were found to be high during the study period, especially at the time of first sex, with predominantly male condoms used. Respondents reported using condoms for protection against disease and prevention from pregnancies. Trends indicate that consistency in the use of condoms declined over the follow-up, and was consistently lower in females than in males. Similar findings were reported in a survey conducted among young adults from the three cities of South Africa, reporting declines in the consistent use of condoms between 2006 and 2010, in Johannesburg, Cape Town, and Durban. The survey also found that males consistently reported higher levels of condom use in the period.

Predictors of condom use include younger age, where younger respondents were more likely to report using condoms more consistently with their last sexual partners. Studies of condom use in South Africa have reported barriers to condom use; increasing age, frequent sex and longer relationship duration as factors which are associated with reduced consistency in condom use. It was unclear why younger respondents were more likely to be consistent condom users but perhaps their older counterparts were in more stable relationships with frequent sexual activities

that lead to a reduction in condom use in their relationships. These findings have also been reported in other studies where efficacy in condom use has been associated with decreasing age.

For both males and females, being in school, and planning to pass Matric exams were significant factors associated with consistency in the use of condoms. It was unclear if respondents attending schools are exposed to sexuality messages that could lead to their different approach in the use of condoms. Previous research has reported that sexuality messages had been shown to delay sexual activities and reduce risky behaviours. This was especially true for younger respondents where sexuality messages have been found to be most effective. Expecting to marry in the near future was also a significant factor for both males and females. It was argued that males and females preparing for marriage were in stable relationships. Previous findings have reported a reduction in condom use in relationships that are stable or where sexual activities are frequent. No differences were observed in males by ethnicity group with Whites, Coloureds and Black Africans reporting similar levels of consistency in the use of condoms. However, cultural norms and the context of sexual activity may increase the chances of reduced condom use, especially among Black females, who mostly grow up in a context that define women's role in society. At household level, no factors were significant for males and only a mother's education and having siblings who helped with homework were significant for females. The same observation was made for community level characteristics implying that condom use was mostly influenced by peers, risk perception, and self-efficacy in the use of condoms. At community level, for both males and females, mean years of community education years was the only significant factor.

In essence, this study established the impact of being in school, planning to pursue further studies, parental education, and community education, on the choices young adults make

regarding consistency in the use of condoms. It is therefore imperative that interventions for condom use be focused on retaining adolescents in school and staying motivated. Programs for condom use should also target youths who may be preparing to enter marriage as these adolescents are already in stable relationships and their likelihood to use condoms consistently need to improve. Finally, the study finds that individual level characteristics are more important determinants of condom use among young adults than household and community level characteristics. Therefore, more interventions for improving condom usage among young adults should mainly focus on individual level characteristics as these seemingly are more influential.

Results from the cumulative risk analysis indicate that very few risk factors were present for determinants of consistency in the use of condoms. This might be the case where several research reports have only reported younger age, condom use at sexual debut, self-efficacy in condom use, and optimism about the future as risk factors. Analysing the presence of risk factors and reporting inconsistency in the use of condoms, this study finds a positive linear association between the number of risk factors present and the proportion reporting inconsistency in the use of condoms with their last sexual partners. This implies that risk factors act cumulatively to predict sexual behaviour through condom use among young adults.

Consistency in using condoms may be associated with a reduction in HIV infections especially in high prevalence settings of South Africa. This in effect implies a reduction in number of people living with HIV and has important implications for population dynamics. HIV infection is associated with a decline in life expectancy of a population because of increased morbidity and mortality from AIDS-related illnesses. Mortality increases among people living with HIV (PLHIV) and is especially high among men when compared to women. This imbalance in the population may affect age-sex composition that is relevant to demography and importantly alter

social aspects of a population. Besides, fertility among persons living with HIV may be different from the general population and this might affect dynamics of population growth and change. Furthermore, condom use acts as form of effective contraceptive, by providing a barrier that is impermeable to sperms during sexual intercourse. Effective contraceptives are critical in preventing unwanted pregnancy. This is especially important for young women who are usually not in marriage when they become sexually active. Understanding aspects of condom use is therefore relevant to contraceptives and fertility, which are key aspects of studying demography and population studies.

7.7 Conclusion

These analyses find that a high proportion of young adults in urban South Africa are using condoms, especially in their first sexual encounters. However, consistency in condom use declines with increasing age, which was important to understand in the context of a high HIV prevalence. Keeping young adults in school was beneficial and provided a great opportunity to target them with behaviour change messages. Ensuring learners are focused on their academic pursuits, and staying positive about future prospects, seems beneficial for safe sexual behaviour practices. Also, we find only a select number of risk factors predict condom use among young people, a fact that could be harnessed to improve levels of condom use by targeting a few but effective interventions. Important risk factors for consistency in condom use were not available at familial or community level, therefore, interventions targeting individual level characteristics may be more effective. Results show that a cumulative risk factor approach was practical for studying consistency in the use of condoms, as young adults reporting more risk factors were more likely to report inconsistency in the use of condoms.

CHAPTER 8: APPLICATION OF A CUMULATIVE RISK FACTOR APPROACH

8.0 Introduction

Cumulative risk has been defined as the combined risk from aggregate exposure to multiple agents. In this study, the influence of risk factors occurring at individual, household, and community levels on adolescent sexual behaviours was investigated. For the results chapters, a cumulative risk analysis has been assessed to evaluate whether determinants of risky sexual behaviour investigated had a cumulative effect, and whether adopting a cumulative risk approach was suitable in the context of adolescents and young adults in urban Cape Town. The study also investigated the hypothesis that exposing young adults to increasing risk factors culminates in a higher likelihood of reporting unsafe sexual behaviours. This chapter reviews basic features of a cumulative risk approach, findings from operationalising this concept in this study, and the relevance of a cumulative risk approach to the study of demography and population studies.

8.1 Features of a Cumulative Risk Approach

Basic features of the cumulative risk approach assessed how varying the number of risk factors present at various levels of the ecology influences adolescents and young adults' sexual behaviours. The aspect of the ecology was defined to include factors that influence sexual behaviours at the level of an individual: where it was postulated that sexual behaviours are influenced by individual characteristics, motivations, and aspirations. Factors at the individual level included age of the respondent, aspirations which include future academic and working plans, attending an education institution, religiosity, and time of onset of sexual activities including age at first sex and age of sexual partners. Susceptibility factors including race and ethnicity may be proxy for socio-economic status, especially in South Africa, but also offers

differences in socio-cultural practices that increase sexual risk among adolescents from certain ethnicities. Secondly, the familial level, includes factors occasioned by household socio-economic status and the relationship which the respondent has cultivated between themselves, their siblings, and their parents. Additional factors at the household level included parental marital status at the time of birth and growing up of the young adult, whether parents were present members in the household, the influence both parents and siblings had on their upbringing, and the socioeconomic status of the family assessed by average meals taken in a day. Findings from these analyses indicate that familial factors offer different effects between male and female respondents. Community level factors play an important role in development of sexual behaviours among adolescent and young adults. Community factors may influence sexual behaviours through proxies of socio-economic indicators estimated by community years of schooling, household annual income, employment status of household heads, and proportion of households headed by females. Findings from this study show that the cumulative effect of poor communities was to increase the likelihood of reporting risky sexual behaviours among adolescents and young adults. Other indicators of socio-economic status in urban South Africa are the suburbs where young respondents resided, with a historical distinction between townships and suburbs occasioned by the apartheid rule that separated White and Black African citizens. Poor suburbs were permissive of behaviours that promote sexual risks and therefore cumulative risks in these neighbourhoods are high and tend to have the effect of increased reports of risky sexual behaviours.

8.2 Efficacy of Cumulative Risk Approach

The historical approach to assessing determinants of risky sexual behaviours may have been to identify isolated factors and evaluate these one at a time in a univariate or multivariate model. This was partly because methods for evaluating a cumulative approach are not been well developed. This thesis has proposed an approach where conventional methods for identifying risk factors are used to single out significant risk factors that are different between two classes of sexual behaviour. All significant factors are then grouped using appropriate cut-off points, informed by literature, to develop analytics that classify the factor as a risk when present or not when absent. The generated risk indices are summed up, providing a cumulative risk index, which is then cross-tabulated against the outcome variables. Findings indicate that for the three sexual risky behaviours investigated, an increasing cumulative risk index corresponds to an increasing proportion of respondents reporting the investigated outcomes. The hypothesis that increasing risk factors in the ecology of adolescents and young adults increases their likelihood of engaging in risky behaviours was therefore postulated to be true according to these findings.

8.3 Results from Cumulative Risk Analysis

8.3.1 Early age at sexual debut

This investigation plotted the proportions reporting early age at first sex against cumulative risk indices for factors identified as significantly different between groups reporting outcomes against those not reporting the outcome. A maximum of seven risk factors were identified for males while six risk factors were identified for females. These factors appeared at individual, household, and community level and significantly predicted the group reporting early sexual activity. Plotting the cumulative risk index against reports of early age at sexual debut shows a

distinct linear relationship between increasing cumulative risk and increasing proportions reporting early sexual debut. Increasing risk factors was linearly associated with higher proportion of adolescents and young adults reporting early sexual debut. In females, having no risk factors present in the ecology was associated with no reports of early sexual activity while having four risk factors was associated with 19% of the respondents reporting early sexual activity. In males, having no risk factors was associated with only 5% of the respondents reporting early sexual activity compared to 36% of males reporting seven risk factors. For males, the linear relationship had an adjusted R-square of 82% and a p-value <0.01 indicating that a significant linear relationship exists between cumulating risk factors and increasing reports of early sexual activity. For females, the linear relationship had an adjusted R-square of 68% and a p-value=0.01 indicating that much of the variability in the proportion reporting early sexual debut could be explained by cumulative risks.

8.3.2 Multiple sexual partnerships

In the analyses of multiple sexual partnerships, majority of males and females reported no risk factors present, with 36% of males and 25% of females having no risk factors present. A maximum of eight risk factors were observed in 0.1% of the male responding and a maximum of five risk factors were observed for females in 4.4% of the respondents. Risk factors for multiple sexual partnerships occurred at individual, household, and community level, demonstrating the collective effect of the ecology on sexual behaviours of adolescents and young adults. In males, having no risk factors present was associated with 17%, having three risk factors present with 40%, having five risk factors with 61%, and having eight risk factors with 100% of respondents reporting multiple sexual partnerships in the last year. For females, no risk factors present was associated with 5%, having three risk factors with 16%, and having five risk factors with 15% of

respondents reporting multiple sexual partnerships in the last year. The linear trends for both males and females had R-squared of 85% for males and 58% for females which were statistically significant with p-values <0.01 and 0.04 respectively. The trends clearly indicate that as more risk factors became present in their ecology, a higher proportion of young adults were reporting multiple sexual partnerships, implying that ecological risk factors act cumulatively to determine sexual risky behaviours.

8.3.3 Consistency in the use of condoms

The cumulative risk indices for consistency in using condoms by adolescent and young adults was constructed using significant factors that differed between the two groups of reporting inconsistency against respondents' reporting consistency. Males had a maximum of four risk factors while females had a maximum of five risk factors present. A higher proportion of males had no risk factors present at 25% compared to females at only 4%. Reporting 0, 1, 2, 3, and 4 risk factors were respectively associated with 28%, 37%, 44%, 55%, and 63% of young males reporting inconsistency in the use of condoms. For females, reporting 0, 1, 2, 3, and 4 risk factors was associated with 31%, 43%, 58%, 66%, and 70% of the young respondents reporting inconsistency in the use of condoms. Again, increasing risk factors in both males and females was associated with an increase in the proportion of respondents reporting inconsistency in the use of condoms with their last sex partner. A statistically significant linear relationship between the proportions reporting inconsistency in condom use and the cumulative risk was established for males and females. In males, the linear trend reported an adjusted R-squared of 99% that was highly significant with p-value<0.01. For females, the linear trend had an adjusted R-squared of 94% that was also highly significant at 94%. Basically, these findings underscore the importance of cumulative risk in explaining the variability in the proportion of young adults reporting

inconsistency in condom use. These findings again show that increasing risk factors present in young respondents' ecology had the effect of increasing the proportion reporting inconsistency in condom use. This implies that risk factors act cumulatively to determine risky sexual behaviours of condom use at last sex.

8.4 Conclusion

Findings indicate that the effect of cumulative risk on the proportions reporting risky sexual behaviours from the three outcomes has a linear relationship. The effect of increasing cumulative risk was to increase the proportion of young adults reporting risky sexual behaviours. Related studies from developed countries have identified relationship between cumulative risk and behaviour problems in early childhood (Ackerman, Izard, Schoff, Youngstrom, & Kogos, 1999). Furthermore, risk factors for the three factors occur at individual, household, and community levels. This implies that for the three risky sexual behaviours, having more risk factors present in the ecology of the young adults increases their likelihood of engaging in risky sexual behaviours reported. These findings may be relevant for South Africa and other sub-Saharan African countries facing stabilised HIV infection rates that may be high and experience unwanted pregnancies among young women. To change adolescent sexual behaviours and reverse the trend in HIV epidemic, interventions should be aimed at multiple levels of the ecology as risk factors occur at the various levels, and act cumulatively to influence sexual behaviours.

Besides, finding that risk factors for sexual risky behaviours act cumulatively, is important to the field of demography and population studies. Outcomes of risky sexual behaviours have an impact on population dynamics including mortality and fertility. Infection with HIV is an important negative outcome of risky sexual behaviours in South Africa, and has been associated

with a decline in life expectancy as mortality from AIDS-related illnesses increases. Besides, mortality patterns from AIDS-related illnesses differ by gender, therefore influencing age-sex composition. Findings related to condom use may have an impact on contraception needs, and may affect fertility trends. Understanding what determines consistency in the use of condoms among adolescent and young people has implications for fertility and teenage pregnancy, important aspects of demography and population studies.

CHAPTER 9: DISCUSSION

9.0 Introduction

This chapter summarises the discussion of result chapters where levels and trends were observed for three risky sexual behaviours that are discussed. The chapter also reviews findings from investigating ecological determinants of risky sexual behaviours, and offers possible explanation of the observed results. Finally, the cumulative risk approach was discussed, and reviews whether the adopted theoretical and conceptual frameworks were adequate for this study, and the overall contribution to demography and population studies field.

9.1 Early Age at Sexual Debut

This study found that a high proportion of adolescents and young adults were initiating sexual activity at an early age. This may be a common finding in studies of sexual and reproductive behavioural research in Southern African countries including South Africa. Even through the reported levels of early sexual initiation were not significantly different from those observed in developed countries, in the context of South Africa characterised by a high HIV prevalence, early sexual activity could fuel the HIV epidemic among adolescents and young adults. This is because when young people engage in early sex, they lack knowledge on safe sexual practices, and may not be using contraceptives. This may increase the risk of contracting sexually transmitted infections and unwanted pregnancies that have negative impact on the rest of their adult life. Therefore, interventions to delay first sexual activity should be considered. Researchers from other countries in Sub-Saharan Africa have argued that early sexual activity may differ between males and females, which was also confirmed in this study (Gyan, 2013). The study also found that early sexual debut in South Africa varies within population groups,

education levels, and socio-economic status of the communities where adolescents thrive. Similar findings have been reported in developed countries (Cunningham & Boult, 1996; Dinkelman et al., 2008). Other studies have pointed out contradicting findings to those observed in this study. Some studies reported that employment opportunities may increase the hazards of early intercourse and related pregnancy, especially in black adolescents (Rich & Kim, 2002). Evidence from this study also indicates that increasing years of education had tangible benefits and was protective from reports of risky sexual activity of early sexual debut. This is possibly the case where learners were attending school and delayed sexual debut, or by influencing economic outcomes where those attending schools had better prospects for work, and working may have delayed sexual debut.

Adopting a cumulative risk factor approach was very practical with results demonstrating a positive linear relationship between number of risk factors present in an adolescent's ecology and proportions reporting early sexual debut. This study finds that increasing risk factors were associated with a higher proportion of respondents reporting early sexual debut. Therefore, adopting a cumulative risk model to study ecological risk factors for early sexual debut was practical and provides a powerful tool for the investigation. Significant risk factors appear at multiple levels of the ecology including factors at individual, household, and community level. Investigating the cumulative effect of risk factors for early sexual debut was a powerful tool for the investigation in settings of urban South Africa, as these findings have only been reported for adolescents in the contexts of developed countries including the US and UK.

Assuming that risk factors occur at the level of the ecology level and act in a cumulative way has a number of implications for both policy and practice in the context of South Africa. Firstly, interventions aimed at delaying sexual debut should target multiple sources within the ecology.

Addressing causes of risky sexual behaviours among adolescents and young adults should not only intervene at individual level but also at household and community levels as these factors also have an influence on early age at sexual debut. Secondly, key messages of safe sexual practices should be disseminated within early learning institutions, and every effort should be made by the government of South Africa to keep young learners in schooling institutions. Education was beneficial especially where learners had aspirations to achieve higher education This study is significant in many ways; it was the first study in South Africa to apply a cumulative risk approach investigating ecological risk factors for early age at sexual debut. Studies emanating from developed countries have reported on the application of the cumulative risk factor approach but differences in the context makes using the model in South Africa an innovative approach (Small & Luster, 1994).

These analyses also had some limitations; the data misses important indicators of peer influence, which might explain findings of sexual activity in a schooling context. In related studies of early sexual activity, peer influence has been reported to determine adolescents and young adults' decision to engage in sexual activity, an hypothesis never tested in this thesis for lack of data indicators(Cherie & Berhane, 2012; Harrison et al., 2012; Lam, Marteleto, & Ranchhod, 2013). Cherie et al (2012) reported peer influence to be the prime driver of sexual behaviour among school attending adolescents in Ethiopia (Cherie & Berhane, 2012). In addition, studies of sexual behaviours are often prone to social desirability bias that may distort responses. In this study, asking questions of early sexual activity to adolescents and young adults may yield misleading responses, as they distort information so that they may look socially desirable. Respondents may report late sexual activity to look good to interviewers, or in the presence of their guardians.

Other studies have also reported that in males, reports of early sexual activity may be desired, to prove their masculinity especially in the Black African culture.

9.2 Multiple Sexual Partnerships

Results from these analyses find that at Wave 1 of the survey, a high proportion of adolescents and young adults were engaging in multiple sexual partnerships, both in the previous year, and lifetime sexual partnerships. Previous research in Southern Africa has reported high levels of multiple sexual partnerships, suggesting that these partnerships differ among males and females, findings that were also confirmed in this study (Onoya et al., 2015). For the entire duration of the follow-up surveys, males consistently reported a higher level of multiple and concurrent partnerships. Similar trends have been observed in other research reports in South Africa where change in behaviour change communication has been attributed to changing risky sexual behaviours(McGrath et al., 2013). Therefore, findings of a decline in the level of MSP during the follow-up period has been documented in other research because of the change in behaviours occasioned by the HIV epidemic and start of ART programmes (McGrath et al., 2013).

Determinants of MSP over follow-up indicate that risk factors appear at various levels of the ecology. Community level factors were especially significant for predicting MSP, as majority of the community risk factors investigated returned as significant for both males and females. Black ethnicity was associated with a higher proportion reporting MSP; which has been reported before and was thought to be driven by gender roles and socio-cultural activities that condone MSP in the lives of Black Africans. The practice of MSP has been reported to be common in Black African communities where female respondents expect men to have steady partners whom they love, and a girlfriend or secret lover whom they meet secretly for sexual activities (Strebel et al.,

2006). Men in these communities have additional relationships for sexual satisfaction, driven by peer pressure, and a cultural belief that men are inclined to naturally have more than one sexual partner. For both females and males, ethnicity was a significant factor for MSP. Education levels and expectations of progressing further with learning were also factors that were significant for both males and females. It was unclear if being at school presented an adolescent with an opportunity to learn about HIV and risky sexual behaviours, but respondents in school and expecting to pursue higher education reported the least levels of MSP. Also, a younger age at the onset of sexual activity was associated with MSP for both males and females in the course of follow-up, findings that have also been reported in other research reports (R. Rector, HJohnson, Martin, & Noyes, 2003). In an analysis of the National Survey of Family and Growth, the study reported linkages between early sexual activity and the number of non-marital sexual partners, with a greater number of partners in the course of their lifetime. Knowing someone who had died of AIDS-related illness was also found to be significant with a higher proportion of respondents also reporting MSP in the last year. Previous studies have reported that among adolescents, who were reported to be aware of HIV transmission modes, lacked the ability to translate this knowledge into risk aversion behaviours (MacPhail & Campbell, 2001).

At household level, having parents who were never married to each other, a father who was mostly absent and less educated parents, were significant factors for MSP in males. This might be the case where fathers tend to be stricter with young adults, compared to mothers who tend to be more accommodative, and may result in significant differences in sexual behaviours if fathers are absent from the home. Historically fathers, especially among Black Africans in South Africa, were mostly absent while working, especially in the mines, with the absence being linked to adolescent distress and risky sexual behaviours. Fathers have been associated with teaching

coping skills to their children, even in studies conducted in developed countries. Thus an absent father scenario translates into adolescent risk taking behaviours (D. W. Brook et al., 2008). Therefore, higher levels of MSP among male respondents with absent fathers can be linked to other traits of child development with absent fathers.

At community level, most of the risk factors reported were found to be significant. For both males and females, living in communities with a higher proportion of unemployed household heads had the effect of higher levels of MSP reported. Many of the community level indicators were proxy for socio-economic status, and clearly, respondents hailing from poor backgrounds were more likely to report MSP. For females, coming from poor households may promote transactional sexual relationships, where they were supplied with material items in exchange for sexual relationships by the male partner who may be parted from their main sexual partner. Transactional sexual relationships are particularly important drivers of new HIV infections in sub-Saharan Africa with many studies documenting huge age gaps for the men and women involved. Several reports have described that it is a persistent issue when negotiating safe sex practices in transactional relationships.

In this study, applying a cumulative risk factor approach was practical with results demonstrating a positive linear relationship between risk factors present in the ecology and the proportion reporting MSP. Significant risk factors appear at multiple levels of the ecology with individual, household, and community level factors all presenting considerable risk. This study finds that as more risk factors become present in the adolescents and young adults' lives, the higher the proportion of reporting MSP. Therefore, adopting a cumulative risk factor model to study ecological risk factors for MSP was practical and provided a powerful tool for investigation.

9.3 Consistency in Use of Condoms

This study examined levels, trends, and determinants of consistency in the use of condoms among adolescents and young adults in urban Cape Town. Levels in the use of condoms were found to be high during the study period, especially at the time of first sex, with predominantly male condoms used. Respondents reported using condoms to protect disease and unwanted pregnancy. Trends indicate that consistency in the use of condoms declined over the follow-up, and was consistently lower in females than in males. Similar findings were reported among young adults among the three cities of South Africa, reporting a decline in the consistent use of condoms between 2006 and 2010, in Johannesburg, Cape Town, and Durban. The survey also found that males consistently reported higher levels of condom use in the period (Cloete, Simbayi, & Rehle, 2014).

Predictors of condom use included younger age, where younger respondents were likely to report using condoms more consistently with their last sexual partners. Studies of condom use in South Africa have reported barriers to condom use; increasing age, frequent sex and longer relationship duration are factors associated with reduced consistency in condom use. It was unclear why younger respondents were more likely to consistently use condoms, perhaps their older counterparts were stable relationships with frequent sexual activities which result in reduction of condom use as observed in previous studies (Cleland & Ali, 2006). Similar findings have been reported in related studies where efficacy in condom use has been associated with decreasing age(Nyembezi et al., 2014).

For both males and females, being in school, and planning to pass Matric exams were significant factors associated with consistency in the use of condoms. It was not clear if respondents attending school were exposed to sexuality messages that could lead to a different approach in

the use of condoms. Previous studies have reported that sexuality messages had been shown to delay sexual activity and reduce risk-taking behaviours. This was true for younger respondents where sexuality messages were found to be most effective. Expecting to marry in the near future was also a significant factor for both males and females. It was envisioned that males and females who were preparing for marriage were in stable relationships and less likely to always use condoms. Literature also confirms these findings where a reported reduction in condom use happens in relationships that were stable and where sexual activities were frequent. Ethnicity groups observed no differences with Whites, Coloureds and Black Africans reporting similar levels of consistency in the use of condoms. However, cultural norms and the context of sexual activity may increase the chances of reduced condom use, especially among Black females, who mostly grow up in the context that defines women's role in society.

At the household level, no factors were significant for males and only a father's education and having siblings who helped with homework were significant for females. At community level, the mean years of community education was a significant factor for both males and females. These findings indicate that peers, risk perception, and self-efficacy in the use of condoms mostly influenced condom use. Therefore, individual level attributes played a more significant role in determining whether the young adult consistently used condoms during the follow-up. This finding was important as interventions for improving condom usage should target individual level characteristics, as the effect of household, and community factors were not significant.

Results from the cumulative risk factor analysis indicate that very few risk factors were present for determinants of consistency in the use of condoms. This might be the case where several research reports have only reported younger age, condom use at sexual debut, self-efficacy in condom use, and optimism about the future. Analysing the presence of risk factors and reporting

inconsistency in the use of condoms, this study finds a linear positive association between the number of risk factors present and the proportion reporting inconsistency in the use of condoms with their last sexual partners. This implies that risk factors act cumulatively to predict the sexual behaviour of condom use among young adults.

These analyses finds that a high proportion of young adults in urban South Africa are using condoms, especially in their first sexual encounters. However, consistency in condom use declines with increasing age, which is important to understand in the context of a high HIV prevalence. Keeping adolescents and young adults in school also seems beneficial as it may provide an opportunity to target them with safe sex behaviour messages. Ensuring learners were focused on their academic pursuits, and staying positive about future prospects, seems beneficial for safe sexual behaviour practices. The study also found that only a select number of risk factors predict condom use among young people, a fact that could be harnessed to improve levels of condom use by targeting the few but effective factors. Only limited factors at the familial and community level seems to influence condom use among adolescents' young adults and it was suggested that interventions targeting individual level characteristics could be more effective.

The ecological model with risk factors appearing in the three levels of the ecology was also applicable, even though individual level characteristics seemed most influential in determining use of condoms. In addition, a cumulative risk factor approach was found to be practical for studying consistency in the use of condoms, as adolescents and young adults reporting increased risk factors had a higher likelihood of reporting inconsistency in the use of condoms.

9.4 Relevance to the Field of Demography and Population Studies

Findings related to risky sexual behaviours are important for the study of demography and population studies as risky sexual behaviours influence HIV transmission, and fertility outcomes of adolescents and young adults. For men, progression to mortality when infected with HIV infected is higher compared to women, which may affect mortality outcomes, and consequently affect age-sex composition at various age categories. Males in an age category may reduce drastically compared to women in the same age category, due to increased mortality related to AIDS, and has important implications for population structure, and fertility. Results for MSPs are also relevant to the study of demography and population studies chiefly because of the influence of sexual networks that increases HIV acquisition. Similarly, unprotected sexual activity increase the risk of HIV acquisition, and may predict early child bearing among adolescents and young adults. Outcomes of risky sexual behaviours as described above influences outcomes of HIV and AIDS, and early childbearing, which have effect on population dynamics including life expectancy, mortality, and fertility.

CHAPTER 10: CONCLUSIONS AND RECOMMENDATIONS

10.0 Conclusion

In conclusion, using a longitudinal follow-up of adolescent and young adult respondents, determinants of risky sexual behaviours of early age at sexual debut, multiple sexual partnerships, and inconsistency in the use of condoms in urban Cape Town, South Africa were described. The study found that risky sexual behaviours of early age at sexual debut, multiple sexual partnerships, and inconsistency in the use of condoms among respondents were highly prevalent the respondents. Even though the observed levels were not particularly different from levels observed in developed countries, in the context of a high HIV prevalence in South Africa, these are particularly important issues that need to be addressed if the HIV epidemic, unwanted pregnancies, and other STIs are to be addressed.

This is important as it adds to existing literature on determinants of risky sexual behaviours of early sex debut, multiple sexual partnerships, and consistency in the use of condoms in the context of South Africa. Findings also demonstrate that risk factors for sexual behaviours analysed appear at three levels of the ecology and have varying degrees of influence on the outcomes. Finally, these determinants of risky sexual behaviours appeared to act cumulatively, with increasing risk factors having an effect on increased proportions of young adults reporting the outcome. Therefore, the hypothesis and the objectives of this study have been validly tested and addressed.

10.1 Relevance to Demography

This study is relevant to the field of demography and population studies in many ways. Firstly, risky sexual behaviours are a major determinant of outcomes of teenage pregnancy and sexually

transmitted infection including HIV. Teenage pregnancy impacts on outcomes of fertility, mortality, and sexual and reproductive health of young adult that is relevant to the dynamics of a population. Mothers younger than 17 years face an increased risk of maternal mortality, because their bodies are not well developed to bear children. Morris (1993) estimated that maternal deaths for teenage mothers below 15 years is two and half times greater than mothers aged 20 to 24 years (L. Morris et al., 1993).

Research studies carried out in Latin America, where teenage pregnancy was reported to be frequent, have reported on increased infant and child mortality for children born to teenage mothers. In Honduras, infant mortality rate was reported at 77.4 deaths per 1000 live births for women under 20 years compared to 48 deaths per 1000 live births for women aged 20 to 34 years (R. Martin, 1993). In fact, high teenage fertility has been linked to poor educational outcomes, and is strongly linked to adult poverty as young women missing school are less prepared for employment (Moore, 1978; Moore et al., 1993). In addition, a high rate of abortion was observed among teenage girls, and has severe implications for health and wellbeing of young women. In South Africa, incidence of early child bearing is high, and remains an important challenge facing the country.

Besides, the risk of HIV infection was increased when young people exhibit behaviours that permit risky sexual activity. These behaviours include initiating early sex, having unprotected sex, and having multiple sexual relationships. The effect of HIV infection is to increase morbidity and mortality from AIDS related illness. Therefore, this study, aiming at understanding ecological determinants of risky sexual behaviours is relevant to demography.

10.2 Policy Relevance

Assuming that risk factors occur at the ecology level and act in a cumulative manner, as was demonstrated in this study, has a number of implications for both policy and practice in the context of South Africa. Firstly, interventions aimed at delaying sexual debut should target multiple sources within the ecology. The study finds that increasing the respondent's years of schooling was protective against early age at sexual debut, a similar finding for those who were currently enrolled in schools. This finding has strong implications for programs that aim to keep young adults in schools, to offer them the protective benefits of increasing years in school and also being enrolled in a learning institution. The other most persistent risk factor for risky sexual behaviours was age of first sexual partner, where reported partnerships were mainly between young people, perhaps in the same age categories. Stiffer penalties for underage sex could be enforced, and programs to discourage young adults from practising sexual relationships with their peers should be implemented. In cases of age disparate relationships, cash transfer programs could be devised, as these relationships are mostly based on transactional sexual activity where young women have rich boyfriends for provision of basic items. Most of the community level factors that were proxy for socio-economic status were significant, indicating that respondents in poor communities were at increased risk of starting sexual activities early.

In addition, interventions for multiple sexual partnerships could be implemented at the three levels of the ecology. Increasing years of education was protective and therefore young adults should be encouraged to stay longer in school. Living in households with people who have died of HIV related illnesses seems to predict a respondent who reports multiple sexual partnerships. It was unclear how this influenced the young adult's decision, but provides a proxy indicator of respondents who were exposed to increased risk factors of multiple sexual partnerships.

Programs should target young people growing up in households with cases of HIV to mitigate the household and community level effect on sexual behaviours as these households and communities were more permissive of risky behaviours. Respondents growing up in broken families where parents were not married, reports increasing levels of multiple sexual partnerships, therefore, childbearing should be encouraged in a family setting where both parents are involved in the upbringing of the child. This aspect was important in shaping sexual and reproductive behaviour of the child as they transition into adulthood. Young adults developing in deprived communities exhibit higher levels of multiple sexual partnerships, perhaps an indication of a higher prevalence of transactional and age disparate sexual relationships mostly driven by economics. Therefore, economic interventions including cash transfer programs could be implemented in such communities, or profiling young people who could be exposed to effective risk factors to mitigate against multiple partnerships.

For condom use, individual level factors seems to exact more influence over household, and community level factors. Younger adults seemed more inclined to use condoms than their elder counterparts, indicating that risk perception was higher for adolescents initiating sexual activities, and therefore utilised condoms more consistently. Therefore, educative programs focusing on the risk associated with unprotected sexual activities might help maintain high levels of condom use, well into the lives of maturing young adults. Being currently in school and planning to pass examinations were protective factors in using condoms. It was unclear if these were proxy indicators of peer influence, where young adults tend to use condoms if more of their friends were also using them. Therefore, keeping children in school, and inspiring them to pass in their examinations, might increase consistency in the use of condom. Parental education and the average years of a community education were protective for consistency in the use of

condoms. Young adults from communities with better education levels, with more educated parents, were shown to be more consistent in the use of condoms. Therefore, efficient interventions against inconsistency in the use of condoms could aim at ensuring that the community level of education was improved across the board.

Addressing causes of risky sexual behaviours among adolescents should not only intervene at individual level but also at household and community level factors as these have been shown to influence the sexual behaviours of the young adults. Secondly, key messages of safe sexual practices could be disseminated at early learning institutions where the local governments ought to implement more policies and incentives for young adults to remain in school. Evidence from this study indicated that education had tangible benefits in many ways: with the potential for learners being in school and delaying sexual debut, to influencing economic outcomes where those working had delayed sexual debut. This study is significant in many ways, as it was the first study in South Africa to apply a cumulative risk approach to investigate ecological risk factors for the mentioned risky sexual behaviours.

10.3 Areas for further Study

Findings from this study indicating that risk factors for risky sexual behaviours act cumulatively calls for further research on promotive models that mitigate the negative effects of cumulative risk. This area of research for South Africa could include risk compensatory models to understand how young adults exposed to an ecology with present risk factors can cope by focusing on what can negate the impact of present risk factors. Research should focus on young adult assets that can be protective against the effect of present risk factors that have been shown

to be cumulative. These models include risk protective and risk compensatory models where further research is required in the context of South Africa.

Further, because of potential data loss occasioned by dichotomising continuous variables in creating the CRI, other methods of generating indexes that incorporates the use of continuous variables would be a potential area for future study. This would enable a sensitivity analysis to compare how well the CRI captures the information presented using continuous variables. However, this was not a problem for categorical variables, which had clear logic in dichotomising into the presence or absence of risk in the values observed for significant variables.

10.4 Limitations of the Study

This study had some limitations; the data misses important indicators of peer influence, which might explain findings of sexual activity in a school context. In addition, studies of sexual behaviours are often prone to social desirability biases that may distort responses. Possible limitations expected in this study include:

1. Non-response proportions reportedly differed between White, African, and Coloured respondents and were particularly high among the Whites. Possible loss to follow-up and missing responses might bias results findings. Baseline analyses of adolescents and young adults were reviewed to assess if there were differences between respondents completing and not completing subsequent surveys. Levels and reasons for missing responses were investigated to assess their potential in distorting information obtained and where possible were highlighted in the discussion of the results obtained.

2. Potential for bias in responses from adolescents and young adults on their sexual behaviours have been reported in related literature. Responder and social desirability bias may have occurred when responding to sensitive questions regarding their sexual behaviours and practices. Because sex has been considered a taboo in most of Southern Africa, some of the responses might be purposely misleading to provide convenient and socially desirable responses. For instance, reporting number of sexual partnerships in the last year, adolescents and young adults with more partners may report fewer numbers because it would look bad reporting high numbers in their culture. This could potentially bias findings in this study and information were triangulated to check on viability of related responses. Using secondary data had the limitation that potential confounders in some of the analyses were not available in the data, for investigation and analyses. This included but not limited to important variables that could affect findings of the three outcomes investigated.

3. Substitution of the households sampled because of non-cooperation or absence of the original household members may have resulted in biased selection of households. This may distort the random selection of households, and non-cooperating households could potentially provide differing information regarding sexual activities and socio-economic status. For instance, it was possible that respondents from wealthier households turned down appointments for interviews because of their value of time. If wealthier households systematically rejected interviews, their representation in the surveys may be compromised, and their views and behaviours that are potentially different could be misrepresented. This however was rarely the case, as non-response rates as reported, were mainly to internal migrations and were generally low.

4. Use of the cumulative risk index approach assumed that all risk factors contributes equal risk to developing an outcome of interest that may not be true every time. Furthermore, the cumulative risk index assumes that complex relationships between risk factors are adequately captured in the index. While using the cumulative risk index has been demonstrated to be a powerful predictor of outcomes than when risk factors are considered in isolation, the index was used mainly because it provided an objective way of combining risk factors. It may be unsuitable when the objective is to quantify the effect of an explanatory variable on the outcome. Other ways of examining cumulative risk may need to be assessed.

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Appendix 1: Turnitin Report



EvansMuchiriPhDdraftTurnitin.docx

ORIGINALITY REPORT

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SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	K. Mkumbo. "The application of Intervention Mapping in developing and implementing school-based sexuality and HIV/AIDS education in a developing country context: The case of Tanzania", Scandinavian Journal of Public Health, 06/01/2009 Publication	2%
2	www.caps.uct.ac.za Internet Source	1%
3	Nyembezi, A., I. Funani, S. Sifunda, R. A. C. Ruiter, B. van den Borne, and P. Reddy. "The psychosocial determinants of the intention to reduce the number of sexual partners among recent traditionally initiated and circumcized men in the Eastern Cape Province, South Africa", Journal of Health Psychology, 2012. Publication	1%

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Appendix 2: Proof reader Certification

2 March 2016

3 Bramber Court
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Sea Point
8005

To whom it may concern

This letter serves to confirm that I have edited the dissertation written by **Evans Mwiti MUCHIRI** for the fufilment of his degree of **Doctor of Philosophy (PhD.) in Demography and Population Studies** through the University of the Witwatersrand, Johannesburg.

I checked for the following:

- Spelling
- Grammar
- Punctuation
- Sentence construction
- Layout consistency

In addition I made suggestions/comments.

I hope you find this declaration to be in order.

Sincerely

Diana Faye Henning
Qual: B.Soc.Sci (UCT), TEFL (Inlingua), Dipl Journalism (Intec)
ID: 5707140019089
Cell: 0823354651
Facebook profile: https://www.facebook.com/profenglish/?ref=hl
LinkedIn profile: https://www.linkedin.com/in/diana-henning-85374538

Appendix 3: Matrix of Literature Review

COMPREHENSIVE LITERATURE REVIEW TABLE

No.	Title	Author	Journal	Methods	Findings	Gaps
1	Global perspectives on the sexual and reproductive health of adolescents: patterns, prevention, and potential.	Bearinger, L. H., Sieving, R. E., Ferguson, J., & Sharma, V. (2007)	*Lancet, 369*(9568), 1220-1231. doi: 10.1016/S0140-6736(07)60367-5	Review of publications	• More investments in AIDS research at the expense of reproductive health needs	• More research is required on adolescent sexual behaviour to prevent early pregnancy, STIs, and HIV in adolescents • All strategies designed for adolescents must be tailored to the unique needs of young people and to the contexts and cultures in which they live.
2	Adolescent pregnancy and associated factors in South African youth	McHunu, G., Peltzer, K., Tutshana, B., & Seutlwadi, L. (2012)	*Afr Health Sci, 12*(4), 426-434	A cross-sectional population based household survey	• Among female adolescents, 19.2% had an adolescent pregnancy • Employment status, greater poverty, and attitudes to sex were associated with increased sexual activity	• Knowledge gaps of causes of unwanted pregnancy
3	Sexual behaviour in a rural high HIV prevalence South African community: time trends in the antiretroviral treatment era.	McGrath, N., Eaton, J. W., Barnighausen, T. W., Tanser, F., & Newell, M. L. (2013).	*AIDS, 27*(15), 2461-2470. doi: 10.1097/01.aids.0000432473.69250.19	General population open cohort	• Reports of condom use at last sex with a regular partner increased by 2.6% per year for men and 4.1% for women • High condom use at last sex with casual partners • Statistically important declines in percentage reporting multiple sexual partners	• Continued monitoring of population-level sexual behaviour indicators is required
4	Community Effects on Youth Sexual Activity.	Baumer, E. P., & South, S. J. (2001)	*Journal of Marriage and the Family*(63), 540–554	Longitudinal data from a national survey of children	• Positive impact of community socio-economic constructs on youth behaviour	• Inconclusive evidence on neighbourhood effects
5	South African National HIV prevalence, HIV incidence and behaviour and communication survey, 2008: a turning tide among teenagers? CapeTown.	Shisana, O., Rehle, T., Simbayi, L., Parker, W., & Zuma, K. (2009)	*HSRC Press*.	Population based HIV sero-prevalence survey	• The 2002, 2005, and 2008 surveys were comparable and similar prevalence levels were found in all three surveys at 11.4% in 2002, 10.8% in 2005, and 10.9% in 2008. • HIV prevalence in the whole population stabilized at 11%.	• Interpretation of HIV prevalence is South Africa is complex • A need for the country to redouble its efforts to HIV prevention
6	Age at sexual debut: a determinant of multiple	Zuma, K., Setswe, G.,	*Afr J Reprod Health, 14*(2),	Cross sectional data with	• Among sexually active adolescents, 39% had early sexual debut (before 16 years).	• More is required to understand predictors of sexual debut among

	partnership among South African youth	Ketye, T., Mzolo, T., Rehle, T., & Mbelle, N. (2010).	47-54.	logistic regression	• Gender differences in sexual activity	adolescents in South Africa
7	Gender, peer and partner influences on adolescent HIV risk in rural South Africa.	Harrison, A., Smit, J., Hoffman, S., Nzama, T., Leu, C. S., Mantell, J., . . . Exner, T. (2012)	*ex Health, 9*(2), 178-186. doi: 10.1071/SH10150	A cross sectional survey of potential HIV risk factors	• Boys were significantly more likely to report lifetime sexual activity (37.7% vs 13.8%) • Among boys and girls, 46.1% reported condom use last sex • Age and peer predicted sexual activity and condom use	• No community variables reported • Broader evidence points from elsewhere points to importance of context in sexual behaviours
8	Adolescent sexual activity: an ecological, risk-factor approach.	Small, S. A., & Luster, T. (1994).	*J Marriage Fam.*(56), 181–192.	A cross-sectional survey of adolescents	• Significant risk factors for adolescent sexual activity • Risk factors for sexual activity vary by gender • Supports the concepts of a cumulative risk factor model for adolescent sexual activity	• This model is applicable but has not been tested in sub-Saharan Africa
9	Contextual effects on the sexual behavior of adolescent women.	Billy, J. O. G., Brewster, K. L., & Grady, W. (1994).	*J Marriage Fam*(56), 387-404.	Individual and community level data from a national survey	• Contextual factors were significant risk factors for adolescent sexual activity • Social disorganization, SES, religiosity, population composition, and availability of family planning affect adolescent sexual activity.	• Context in this study was at two-levels. Adding other levels of the context will enrich research
10	The influence of male and female best friends on adolescent sexual behavior.	Billy, J. O., & Udry, J. R. (1985)	*Adolescence, 20*(77), 21-32.	Panel data from a junior high school	• Influence of peers on transitioning into sexual activity among adolescents varied by gender. Was not significant for males but was significant for females.	• Additional variables needed to be investigated
11	The Ecology of human development: Experiments by nature and design.	Bronfenbrenner, U. (1979).	*Harvard University Press*(Cambridge, MA:)	Theoretical perspective for study of human development	• Ecological framework perspective is a useful approach while studying human development	• This model needs to be tested in sub-Saharan Africa
12	Ecology of the family as a context for human development:Research perspectives.	Bronfenbrenner, U. (1986).	*Developmental Psychology, 22*(6), 723-742	Theoretical perspective for study of human development	• Ecological framework perspective is a useful approach while studying human development	• This model needs to be tested in sub-Saharan Africa
13	Ecological Models of Human Development.	Bronfenbrenner, U.	*International Encyclopedia of*	Theoretical perspective for	• Ecological framework perspective is a useful approach while studying human	• This model needs to be tested in sub-Saharan Africa

		(1994).	*Education, 3*(2)	study of human development	development	
14	The ecology of developmental processes.	Bronfenbrenner, U., & Morris, P. (1998)	*Handbook of Child Psychology, 1*(5), 993-1028	Theoretical perspective for study of human development	• Ecological framework perspective is a useful approach while studying human development	• This model needs to be tested in sub-Saharan Africa
15	Community influences on young people's sexual behavior in 3 African countries.	Stephenson, R. (2009).	*Am J Public Health, 99*(1), 102-109. doi: 10.2105/AJPH.2007.126904	Demographic and health surveys data from Burkina Faso, Ghana, and Zambia	• Community economic conditions shaped the behaviour of adolescents	• Uses regression models, and the gap would be to apply a accumulative risk factor approach
16	Household and community income, economic shocks and risky sexual behavior of young adults: evidence from the Cape Area Panel Study 2002 and 2005.	Dinkelman, T., Lam, D., & Leibbrandt, M. (2007).	*AIDS, 21 Suppl 7*, S49-56. doi: 10.1097/01.aids.0000300535.05226.a9	Cape Are Panel Data for measured between 2002 and 2005	• Increase in condom use and decrease in incidence of multiple sexual partnerships	• Use of probit models, a potential gap is to apply a cumulative risk factor index
17	Linking Poverty and Income Shocks to Risky Sexual Behaviour: Evidence from a Panel Study of Young Adults in Cape Town.	Dinkelman, T., Lam, D., & Leibbrandt, M. (2008).	*S Afr J Econ, 76*(supp1), s52-s74. doi: 10.1111/j.1813-6982.2008.00170.	Cape Are Panel Data for measured between 2002 and 2005	• Females in poorer households are more likely to be sexually active and more likely to sexually debut	• No clear differences in condom use, potential to investigate this in detail
18	Youth in sub-Saharan Africa.	Blum, R. W. (2007).	*J Adolesc Health, 41*(3), 230-238. doi: 10.1016/j.jadohealth.2007.04.005	ew of articles	• School enrolment has increased but females remain disadvantaged. • HIV and maternal mortality remains high in sub-Saharan Africa	• Youth are experiencing rapid social change, more research should be directed to understand the high HIV prevalence, and fewer opportunities despite the natural resources
19	Adolescent health in an international context: the challenge of sexual and reproductive health in sub-Saharan Africa. (2009).	Fatusi, A., & Blum, R. W.	Adolesc Med State Art Rev, 20(3), 874-886, viii.	Review of articles	• HIV/AIDS, and reproductive health challenges are main concern for adolescents in SSA. • Mortality and morbidity vary according to countries of the world	• More research is needed to inform the problems of adolescent HIV, maternal mortality, and poverty
20	The sexual behaviour of adolescents in sub-Saharan Africa: patterns	Doyle, A., Mavedzenge, S. N.,	*Trop Med Int Health, 17*(7), 796-807. doi:	Demographic and AIDS indicator	• Up to 25% of 15 – 19 year old reported sex before the age of 15 years. • Early child bearing and marriage were	• Routine collection and analysis of reproductive and sexual health data to monitor sexual behaviours because of

	and trends from national surveys.	Plummer, M. L., & Ross, D. A. (2012).	10.1111/j.1365-3156.2012.03005.x	surveys data from 24 countries of SSA	common among the least educated.	the risk posed by HIV and teenage pregnancy.
21	Factors influencing the timing of first sexual intercourse among young people in Nyanza, Kenya.	Tenkorang, E. Y., & Maticka-Tyndale, E. (2008).	*Int Fam Plan Perspect, 34*(4), 177-188. doi: 10.1363/ifpp.34.177.08	Survey data collected in Kenya	• Adolescents who rejected myths about HIV transmission, who experience little peer pressure for sex, and those who never knew anyone dying of HIV were more likely to postpone sexual activity.	• No research on attitudes of individual and communities to dispel HIV myths
22	Correlates of ever had sex and of recent sex among teenagers and young unmarried adults in the Democratic Republic of Congo.	Kayembe, K. P., Mapatano, M. A., Busangu, F. A., Nyandwe, K. J., Mashinda, K.	*AIDS Behav, 12*(4), 585-593. doi: 10.1007/s10461-007-9290-z	Cluster sampled surveys in DR Congo	• A majority of young people reported sexual debut and with multiple partnerships • Sexual debut was associated with school dropouts, drug use, and those living alone or with friends	• Only individual level variables investigated. Need to investigate community and household variables.
23	Sexual behaviour in context: a global perspective.	Wellings, K., Collumbien, M., Slaymaker, E., Singh, S., Hodges, Z., Patel, D., &	*Lancet, 368*(9548), 1706-1728. doi: 10.1016/S0140-6736(06)69479-8	Analyses of sexual behaviour data from 59 countries	• Substantial diversity in trends of sexual behaviours • Trends towards late marriages.	• Individual, and contextual factors should be investigated to account for variation in sexual activities
24	Why has HIV stabilized in South Africa, yet not declined further? Age and sexual behavior patterns among youth.	Katz, I., & Low-Beer, D. (2008).	*Sex Transm Dis, 35*(10), 837-842. doi: 10.1097/OLQ.0b013e31817c0be5	HIV and sexual behaviour prevalence surveys compared between Uganda and South Africa	• Most 15-24 year old South Africans have demonstrated behaviour change and have moderate risk factors • HIV prevalence of SA youths is almost twice of youths in Uganda	• More research is required on contextual factors or fighting HIV in South Africa.
25	Gender, peer and partner influences on adolescent HIV risk in rural South Africa.	Harrison, A., Smit, J., Hoffman, S., Nzama, T.,	*Sex Health, 9*(2), 178-186. doi: 10.1071/SH10150	A cross sectional study among adolescents in SA	• Boys reported higher sexual activity compared to girls – multiple sexual partnerships, and sexual activity	• Understanding individual, and household characteristics important for sexual behaviour aversion.
26	HIV/AIDS Knowledge and Sexual Behavior Among Junior Secondary School Students in South Africa	Peltzer, K., & Promtussananon, S. (2005).	*Journal of Social Sciences 1 (1): 1-8, 2005 ISSN 1549-3652*	Cross-sectional survey design	• Reports that 46% of 16 year old males are sexually experienced and002020% of 15.5 year old females. • Under 44% of those who had sex did not use condoms at last sex	• No reports of trends over time of prevalence of sexual behaviours

27	'I think condoms are good but, aai, I hate those things': condom use among adolescents and young people in a Southern African township.	MacPhail, C., & Campbell, C. (2001).	*Soc Sci Med, 52*(11), 1613-1627.	Focus group discussion	• Reported on community and social factors hindering condom use • Existence of social norms that which places young people at sexual health risk	• No quantitative approach • No investigation of the cumulative effect of community and social factors
28	Understanding perceptions of HIV risk among adolescents in KwaZulu-Natal.	Macintyre, K., Rutenberg, N., Brown, L., & Karim, A. (2004).	*AIDS Behav, 8*(3), 237-250. doi: 10.1023/B:AIBE.0000044072.71361.b3	Cross-sectional survey design and logistic regression analysis	• Risk perception was associated with connectedness to parents and community	• Programs to alter youth's environment essential to risk perception. More research required on community factors
29	Where the action is: monitoring local trends in sexual behaviour.	Weir, S. S., Tate, J. E., Zhusupov, B., & Boerma, J. T. (2004).	*Sex Transm Infect, 80 Suppl 2*, ii63-68. doi: 10.1136/sti.2004.012336	Sexual data using household surveys	• Reduction in sexual behaviours in South Africa between 2002 and 2003 • Reported increase in condom use	• Determinants for sexual behaviours not reported
30	Condom use as part of the wider HIV prevention strategy: experiences from communities in the North West Province, South Africa.	Versteeg, M., & Murray, M. (2008).	*SAHARA J, 5*(2), 83-93.	Sexual data using household surveys and focus groups with interviews	• Condoms in the public were widely available and accessible	• Barriers to condom use interventions should not only target individual characteristics but also community level
31	Teenage pregnancy in South Africa - with a specific focus on school-going learners.	Panday, S., Makiwane, M., Ranchod, C., & Letsoalo, T. (2009)	Child, Youth, Family and Social Development, HSRC. Pretoria: Department of Basic Education	Review of literature on teenage pregnancy in South Africa	• Trends in teenage pregnancy reported to be declining by 2008 • Pregnancies higher in schools located in poor neighbourhoods • Trends in pregnancy varied by province	• Determinants of teenage pregnancy reported only at the individual level

Appendix 4: Publication Plan and Conferences

Title	Thesis Chapter	Abstract	Status	Journal	Periodicity	submit
1. Ecological correlates of multiple sexual partnerships among adolescents and young adults in urban Cape Town: a cumulative risk factor approach	Chapter 6 Determinants of multiple sexual partnerships	Studies in South Africa have reported high levels of unsafe sexual activity among young adults, with the country having the highest burden of HIV/AIDS globally, as well as a high rate of underage pregnancy.	*Published*	African Journal of AIDS Research		Jan 2016
2. *HIV risk perception and consistency in condom use among adolescents and young adults in urban Cape Town, South Africa: a cumulative risk analysis*	Chapter7 Determinants of consistency in use of condoms	The relationship between HIV risk perception and consistency in the use of condoms is scarcely understood in the context of a high HIV prevalence among young adults in urban South Africa.	*Published*	South African Journal of Infectious Diseases		Oct 2015
3. Application of a cumulative risk factor approach to study adolescent sexual activity in urban Cape Town: an ecological perspective	Chapter 8 Application of a cumulative risk factor approach	The historical approach to assessing risk factors of sexual behaviours has been based on individual level factors, and even then, risk factors have been considered in isolation. Young adults are exposed to a wide variety of individual, household, and community level factors that have potential to impact on their sexual behaviours and risk taking activities.	*Draft*	Demography		April 2018
4. Ecological determinants of early age at sex debut among young adults in urban Cape Town: a cumulative risk factor approach	Chapter 5 Determinants of early age at sex debut	A high proportion of adolescents in South Africa are initiating sexual activities early. Early sexual activities are associated with an early HIV infection and unwanted teenage pregnancy. South Africa has the highest number of people living with HIV/AIDS of any country in the world and young people are particularly affected.	*Good Draft*	Demography Perspective		Nov 2018

Appendix 5: Conferences presented

Title	Thesis Chapter	Abstract	Status	Conference	City, Country	submit
1. Contextual Determinants of Sexual Risky Behaviours among Adolescents in Urban Cape Town, South Africa: Findings from a Longitudinal Study Using a Cumulative Risk Factor Approach	Chapter 5/6/7 Determinants of condom use/multiple sexual partnerships/early age at sexual debut	This article presents findings from the Cape Area Panel Study (CAPS) of adolescents and young adults in urban Cape Town, South Africa. The analyses adopted an innovative cumulative risk factor approach to study contextual determinants of sexual risky behaviours where risk factors are organized using the ecological framework theory.	*Presented : Oral*	Population Association of America (PAA)	San Diego, USA	May 2015
2. *Ecological determinants of Multiple Sexual partnerships among adolescents in urban Cape Town, A cumulative Risk Factor Approach*	Chapter 6 Determinants of multiple sexual partnerships	Adolescents in South Africa are at an increased risk of HIV infection because of the context they develop in; the country has the highest HIV burden in the world, and the practice of multiple sexual partnerships is highly prevalent.	*Presented : Oral*	Union of African Population Studies (UAPS)	Johannesburg , South Africa	Dec 2015
3. Application of a Cumulative Risk Factor Approach to Study Adolescent Sexual Activity in Urban Cape Town	Chapter 5/6/7 Determinants of condom use/multiple sexual partnerships/early age at sexual debut	Risk factors for sexual behaviours have mainly been based on individual level characteristics, and these have been considered in isolation. Young adults live within familial and neighbourhood contexts that tend to impact their sexual behaviours.	*Poster presented*	IUSSP	Cape Town, South Africa	Oct 2017
4. Pop Studies Mini Conference	Chapters 1 to 10	Presentation slides of PhD work progress with input from DPS staff and DPS colleagues	*Presented: Oral*	DPS Seminar		Nov 2015
5. Population	Applying a		*Poster*			

	Association of Southern Africa	Cumulative Risk Factor Approach to Study Adolescent Sexual Activity in South Africa		*presented*			
6.	6th Cross-faculty symposium, University of the Witwatersrand	A cumulative Risk Model To Study adolescents' Sexual Risky Behaviours: Early Sex Debut in the Cape Area, South Africa		*Poster presented*	University of the Witwatersrand		
7.							

Appendix 6: Policy Brief

Title: Ecological determinants of risky sexual behaviours among adolescents and young adults in Cape Town, South Africa: A cumulative risk factor approach.

Student Number: 741906

Names: Evans Mwiti Muchiri

Department: Demography and Population Studies

POLICY BRIEF

Policy Users:

Department of Social Development (DSD),

Department of Basic Education (DBE)

Department of Health

UNFPA

UNICEF

UNAIDS

Introduction

South Africa has the largest population of people living with HIV (PLHIV) of any county in the world. Further, a large proportion of PLHIV constitute the adolescents and young adults, and forms the largest proportion of new HIV infections every year according to reports from UNAIDS and HSRC. This may reduce the productivity of young people from illnesses related to HIV/AIDS. Research findings further indicate that South African adolescents and young adults start sexual activity early, with multiple partners, and may not use condoms for protection. Unprotected early sex with multiple partners exposes them to increased risk of HIV infection and early pregnancy for young women. This matters for South Africa not only because of the cost associated with treating and managing HIV, but also the implications of unwanted pregnancy for underage mothers.

Context

Reports from Statistics South Africa reported that 40% of the South African population was aged between 15 and 35 years in 2015. This shows that South Africa has a large youthful population compared to the dependent population, and a demographic dividend could be achieved if policies that encourage productivity from youths were implemented. However, morbidity and mortality occasioned by AIDS related illnesses among the youthful population makes it not obvious for South Africa to achieve a demographic dividend. Further, young women experiencing pregnancy and childbearing lose valuable schooling time that may impact on their future training, fertility and employment.

Reports indicate that adolescents and young adults contribute to over half of all new HIV infections in South Africa (Rehle et al., 2010). Further, 30% of teenage girls in the country are estimated to have given birth before the age of 20 years by 2008 (Panday et al., 2009). For South Africa to achieve a demographic dividend, interventions to improve outcomes of sexual behaviours, which delays unsafe sexual activity to reduce underage pregnancy and new HIV infections are urgently required.

This policy brief summarizes findings from a study investigating on ecological risk factors for risky sexual behaviours among adolescents and young adults in Cape Town, South Africa. Further, seeking to understand whether ecological risk factors have a cumulative effect on outcomes of sexual behaviours of early age at sex debut, multiple sexual partnerships, and condom use among adolescents and young adults.

Specific Findings

Findings from this analyses indicated that adolescents and young adults from deprived households and communities in the Cape Area of South Africa reported more incidents of early sex, more sex partners, and often had unprotected sex. Results further indicate that being currently in school and aspiring to achieve higher education delayed sexual activity and increased consistency in the use of condoms. Furthermore, significant risk factors occurring at the ecology level to include familial, household, and community variables had a significant cumulative effect on outcomes of risky sexual behaviours of early sex, multiple partnerships, and consistency in use of condoms.

Figure 1: Indicates that a high proportion of adolescents and young adults reporting early sexual activity and multiple sexual partnerships originated from communities with higher levels of household unemployment and mainly resided in informal settlements

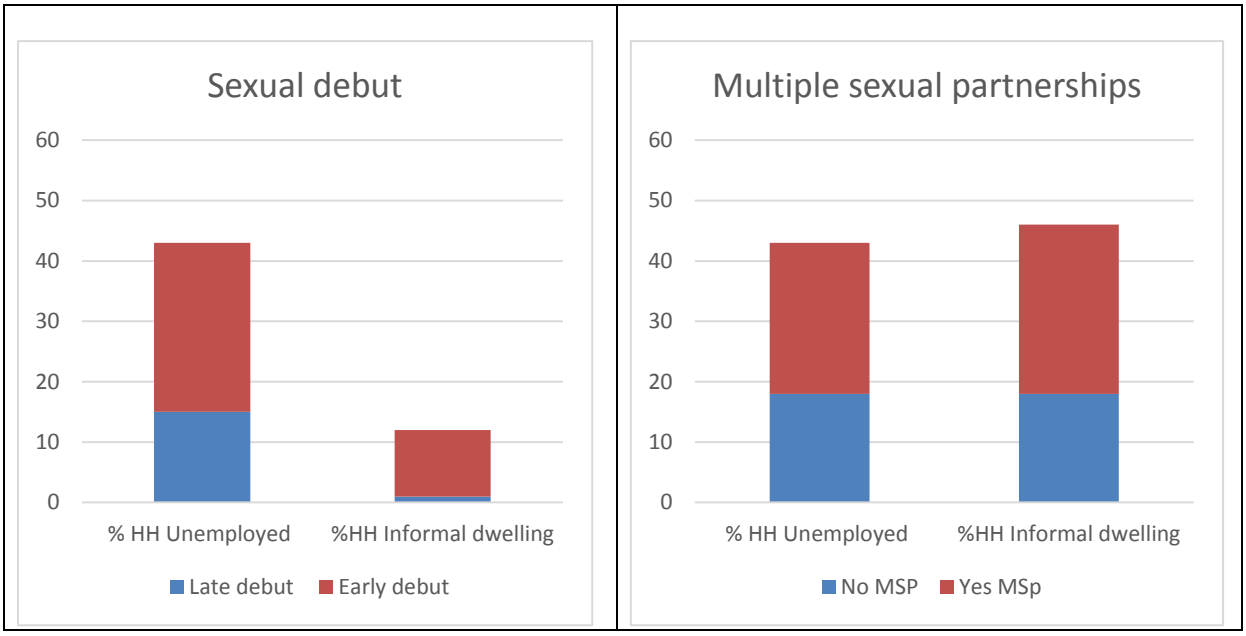
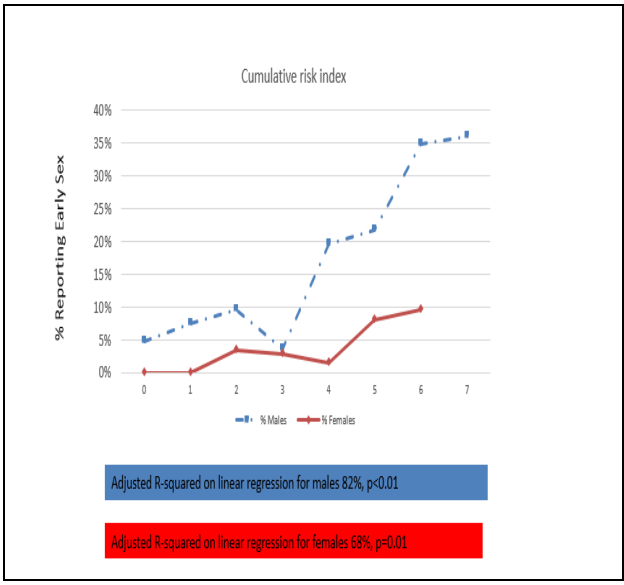
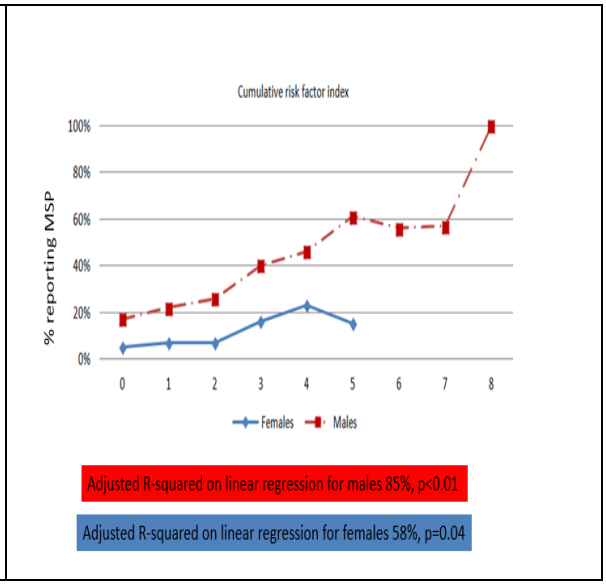


Figure 2 further indicates that ecological risk factors for early sex debut and multiple sexual partnerships had a cumulative effect, suggesting that as risk factors increased, both male and female respondents had increased likelihood of reporting the outcomes





Policy Implications

Adolescents and young adults developing in deprived neighbourhoods report increased risky sexual activity compared to their contemporaries developing in better-off neighbourhoods. This implies that they were more likely to report early sex, have multiple sexual partnerships, and engaging in unprotected sex activity. This has implications for HIV acquisition and underage pregnancies, which have significant ramifications for South Africa given that 63% of youths, are raised in poor households. Further, there was evidence that as risk factors for early sex and multiple sexual partnerships becomes more; this increases the likelihood of adolescents and young adults to report negative sexual behaviours. Thus interventions for sexual behaviours among adolescents and young adults should incorporate programmes that are effective at the individual, household, and community levels

Cash transfer programmes have demonstrated a reduction in risk taking behaviours among adolescents and young adults especially among females in India and Bangladesh. There is evidence that regular stipends provided to young women reduces transactional sex that mainly is transgenerational in nature. The effect of this is a reduction in risks involved with older sexual partners who have an increased exposure to HIV acquisition. Further, providing schooling opportunities like bursaries keeps adolescents and young adults in schools. Providing financial incentives in the form of cash transfers and schooling opportunities including scholarships and bursaries may positively on adolescents and young adults' sexual behaviours and nation.