ScholarWorks@GSU

Correlates and Contexts of High-Risk Sexual Behaviors Among Youth in the Slums of Kampala: Implications for HIV Prevention and Program Development

Authors	Palmier, Jane B
Citation	Palmier, Jane B. "Correlates and Contexts of High-Risk Sexual Behaviors Among Youth in the Slums of Kampala: Implications for HIV Prevention and Program Development." Dissertation, Georgia State University, 2021. https://doi.org/10.57709/22767364
DOI	https://doi.org/10.57709/22767364
Download date	2026-02-18 21:47:48
Link to Item	https://hdl.handle.net/20.500.14694/14269

Correlates and Contexts of High-Risk Sexual Behaviors among Youth in the Slums of Kampala: Implications for HIV Prevention and Program Development

Jane B. Palmier, JD, MPH
PhD Candidate
School of Public Health
Three-Manuscript Dissertation

Committee:
Monica H. Swahn, PhD, MPH (Dissertation Chair)
Richard Rothenberg, MD, MPH (Dissertation Committee Member)
Andrew L. Baughman, PhD, MPH (Dissertation Committee Member)
Rachel Culbreth, PhD, MPH, RRT (Dissertation Committee Member)

Correlates and Contexts of High-Risk Sexual Behaviors among Youth in the Slums of Kampala: Implications for HIV Prevention and Program Development

By

Jane B. Palmier

J.D., University of Pennsylvania

M.P.H., Georgia State University

B.A., Binghamton University

A Three-Manuscript Dissertation Submitted to the Graduate Faculty
of Georgia State University in Partial Fulfillment
of the
Requirements for the Degree

DOCTOR OF PHILOSOPHY IN PUBLIC HEALTH

ATLANTA, GEORGIA
30303

Approval Page

Correlates and Contexts of High-Risk Sexual Behaviors Among Youth in the Slums of Kampala: Implications HIV Prevention and Program Development

By
Jane B. Palmier

Approved:

*Monica H. Swahn*____
Monica H. Swahn, PhD, MPH
Committee Chair

Richard Rothenberg ____
Richard Rothenberg, MD, MPH
Committee Member

*Andrew L. Baughman*____
Andrew L. Baughman, PhD, MPH
Committee Member

*Rachel Culbreth*____
Rachel Culbreth, PhD, MPH, RRT
Committee Member

April 23, 2021

Acknowledgements

I would like to express my sincere gratitude to my Advisor and Chair Dr. Monica Swahn for her steadfast guidance, support and inspiration in completion of this dissertation and for my pursuit of global health. She has been my champion along the long journey to the finish line and it would not have been possible without her constant support, mentoring and passion for global health issues and vulnerable populations.

I would also like to thank my Committee Members: Dr Richard Rothenberg, for inspiring my interest and passion for epidemiology and HIV research; Dr Rachel Culbreth, for the constant guidance and mentoring in analytics, research methods and committed teamwork and passion for our Uganda research; and, Dr. Drew Baughman, for the statistical expertise and perspective and continued mentoring which began during our shared global health experience in Namibia.

To my family and close friends who have supported and encouraged me along this winding journey and to those who are not here to see me to completion—my Dad, who supported my career change and love of global health, and Carol, who pushed me to finish and supported my overseas mission in global health.

And to the youth at UYDEL for participating in this research and to Rogers Kasirye for supporting this research and for successful collaborations over the last 10 years.

Author’s Statement Page

In presenting this dissertation as a partial fulfillment of the requirements for an advanced degree from Georgia State University, I agree that the Library of the University shall make it available for inspection and circulation in accordance with its regulations governing materials of this type. I agree that permission to quote from, to copy from, or to publish this dissertation may be granted by the author or, in his/her absence, by the professor under whose direction it was written, or in his/her absence, by the Associate Dean, School of Public Health. Such quoting, copying, or publishing must be solely for scholarly purposes and will not involve potential financial gain. It is understood that any copying from or publication of this dissertation which involves potential financial gain will not be allowed without written permission of the author.

Jane B. Palmier

Jane B. Palmier

ABSTRACT

Globally, HIV remains a critical public health issue with almost 40 million people currently living with HIV worldwide and millions who have died of AIDS since the start of the epidemic. As HIV affects the health of individuals, it also adversely impacts families, communities, and the development and stability of nations. Many of the countries hardest hit by HIV are resource-poor and suffer from other health issues and challenges. In Uganda, HIV prevalence among adults is still high and two-thirds of the urban population live in slum communities in the densely populated capital city of Kampala where lack of basic services negatively affects health and quality of life. The rapid growth of urban slums in the region is a cause for concern and data is limited on the health and risk behaviors of adolescents who live in these slums. Studies show that disease burden and premature death among adults can be associated with behaviors or conditions that began during adolescence. Youth who live on the streets and in the slums face much of the burden related to poverty, lack of family support, risk of HIV and other health issues. The three dissertation studies aimed to examine the drivers, contexts and patterns of high-risk and protective sexual behaviors which is critical for program development and interventions among understudied vulnerable youth and to complement the biomedical interventions that have greatly impacted the epidemic, but have not been able to achieve zero new infections. Using data from Kampala, the studies specifically aimed to: 1) examine the impact of individual level correlates of consistent condom use among sexually-active slum youth were examined to address and eliminate barriers to condom use in this sub-population of youth. Results showed that consistent condom use was low and was associated with condom use at sexual debut, no alcohol use before sex, condom use planning and self-efficacy; 2) examine the individual and community-level factors for engaging in multiple sexual partnerships among sexually active slum youth and whether sexual behaviors of the youth vary across the slum locations. We found a high prevalence of multiple sexual partnerships and that early sexual debut, alcohol use in the past year, alcohol use before sex and transactional sex were associated with multiple sexual partnerships. We also found that risk behaviors, including early sexual debut, alcohol use, and transactional sex varied greatly across the slum locations; 3) explore patterns of sexual risk behaviors and examine risk behavior and parental factors associated with these patterns. A latent class analysis was used to empirically identify three distinct classes of youth based on a set of their sexual risk behaviors, and examine the role of parental influence on the classes of sexual risk behavior. We found using alcohol before sex was a highly significant for youth in the high-risk class. Parental living status was also significantly associated with both the high risk and medium risk classes. The findings show that sexual risk classes have different behavioral and parental characteristics. The three studies highlight the need for tailored, targeted, multi-pronged programs, rather than a silo approach, to address multiple risk patterns, for effective HIV and STI prevention.

Table of Contents

List of Tables and Figures

CHAPTER 1. Introduction and significance

1.0   Background

1.0.1 HIV/AIDS Globally

HIV, the virus that causes Acquired Immunodeficiency Syndrome ("AIDS") is the most serious epidemic in the world. There are nearly 40 million people currently living with HIV (UNAIDS, 2020) and millions of people have died of AIDS since the start of the epidemic. The annual number of new infections has declined annually since 2010 from 2.1 million to 1.7 million in 2018, only a 16% reduction overall. That leaves the epidemic far from the 2020 target of fewer than 500,000 new infections per year (UNAIDS, 2019). Of all the areas, almost 70% of the total cases are in sub-Saharan Africa. Moreover, over 40% of the new cases are located in Eastern and Southern Africa and a third of new infections globally are among young people, ages 15-24 (UNAIDS, 2019).

As HIV affects the health of individuals, it also adversely impacts households, communities, and the development and economic growth and stability of nations. Many of the countries hardest hit by HIV are resource-poor and concurrently suffer from other health issues and diseases, food insecurity, and other serious challenges.   The adverse impact of HIV can be seen on life expectancy, households (loss of earners and parents), education and school-attendance (dropping out of school due to loss of parents and support of school fees), labor and productivity and economic development.

Global scale-up of antiretroviral therapy (ART) has been the primary factor in the 48% decline in deaths from AIDS-related causes, from a peak of 1.9 million in 2005 to 1.0 million in

2016 (UNAIDS, 2016). Although deaths from AIDS-related illnesses were 27% lower among women and girls in 2016 than they were among men and boys, AIDS-related illnesses remain the leading cause of death among women of reproductive age (15–49 years) globally, and they are the second leading cause of death for young women aged 15–24 years in Africa (UNAIDS, 2016). The number of children (aged 0–14 years) dying of AIDS-related illnesses was nearly cut in half in just six years, from 210,000 in 2010 to 120,000 in 2016. Much of the decline is due to steep reductions in new HIV infections among children, with increased access to pediatric antiretroviral therapy also playing an important role (UNAIDS, 2016).

1.0.2 HIV among youth and adults in Uganda

There are an estimated 1.4 million people in Uganda living with HIV, and an estimated 23,000 Ugandans died of AIDS-related illnesses per year (UNAIDS, 2020). The estimated HIV prevalence among adults in Uganda (aged 15 to 49) is 6.2% (Uganda Ministry of Health, 2019; UNAIDS, 2019). Annual new infections are projected to grow from 52,000 in 2016 to 340,000 in 2025 (UAC, 2015). Women are disproportionately affected, with 8.8% of adult women living with HIV compared to 4.3% of men (Uganda Ministry of Health, 2019).

Uganda has a large youth population as highlighted by the 2016 Uganda Demographic Health Survey (Uganda Bureau of Statistics - UBOS & ICF, 2018). Sixty percent (60%) of the respondents were under the age of 30, reflective of the high proportion of youth in the Uganda population and the fact that half of the Ugandan population is under age 15. The 2016 Uganda Population-based HIV Impact Assessment was a population-based national survey conducted to provide estimates of HIV incidence, HIV prevalence, viral load suppression, syphilis, hepatitis B infection, and other important HIV/AIDS program indicators (Uganda Ministry of Health, 2019).

Data were collected in all districts of the country from a sample of households that were representative of the Ugandan population. Overall, the findings from the survey show that 6.2% of adults (ages 15-64) are HIV positive (7.6% among females and 4.7% among males). This corresponds to approximately 1.2 million people aged 15 to 64 living with HIV in Uganda. HIV prevalence is also higher among women living in urban areas (9.8%) than those in rural areas (6.7%). In contrast, HIV prevalence is the same for men living in urban (4.6%) and rural (4.7%) areas. The prevalence of HIV among children aged 0-14 is 0.5% which corresponds to approximately 95,000 children living with HIV in Uganda. The results of HIV prevalence by region showed a variation across the Uganda ranging from 3.1% in the West Nile region to 8.0% in the Central region. The Kampala region's prevalence of HIV among those aged 15-64 is 6.9%. Among young adults, there is a marked disparity in HIV prevalence by sex. Among those 15-24, HIV prevalence is almost four times higher among females than males.

The Uganda Demographic Health Survey (UDHS) was another nationally representative survey conducted in 2016 (Uganda Bureau of Statistics - UBOS & ICF, 2018). The 2016 UDHS included questions on respondents' sexual behaviors. The results of high risk sexual indicators showed high levels of multiple sexual partners among men and low levels of condom use across both males and females. Overall, only two percent (2%) of women ages 15-49 reported that they had two or more partners in the past 12 months, and among those women, 21% reported using a condom during their last sexual intercourse. The mean number of lifetime partners among all women who have ever had sexual intercourse was 2.3. Twenty-one percent (21%) of men, ages 15-49, reported that they had two or more partners in the past 12 months and 22% of those men reported using a condom during their last sexual intercourse. The mean number of lifetime partners among all men who have ever had sexual intercourse was 6.3 partners. Among young women, ages 15-19, who had 2+ partners in the past 12 months (2.2%), only 26% reported using a condom during last sexual intercourse and the mean number of lifetime sexual partners was 1.7. Among young men ages 15-19, 6.6% had 2 or more partners in the past 12 months and 52.1% of the men reported using a condom during last sexual encounter and the mean number of lifetime sexual partners was 3.4.

1.0.3 Uganda's Adolescent Population, Health risk behaviors and HIV

Uganda's adolescent population (those aged 10-19 years) is estimated to be 25% of its population (Ministry of Health, 2017) and nearly 40% of young people aged 10-19 live in the two poorest wealth quintiles, 22% of adolescents (13-18 years of age) have left school and 25% reside in urban areas. The Adolescent Health Risk Behavior Survey (AHRBS) results reported that 66% of all new HIV infections are concentrated among adolescent girls and 49% of the sexually active adolescents used a contraceptive method the last they had sex. However, the report notes that data are limited on health and social risk behaviors of adolescents especially those who are ages 10-14 years (cite). Regarding sexual risk behaviors, overall, 21.5% of adolescents reported ever had sexual intercourse, and 10% of the sexually active adolescents aged 15-19 years had their first sex encounter before age 15. Multiple lifetime partnerships were common (43.6%), as was transactional sex (26.9%). Non-use of condoms with last sexual partner was 57.3% while trans-generational sex was 7.1%. Awareness of HIV was very high (93.6%) *but ever-testing for HIV was low* (42.5%) with a 1.9% self-reported HIV infection. Self-reported ever infection with STIs was twice as high in females (13%) compared to males (6%).

Prevention of HIV infection in adolescent girls and young women (AGYW) remains an important challenge. While new HIV infections have fallen globally by 35% since 2000, including in sub-Saharan Africa with an estimated 1.4 million new HIV infections in 2014, representing a drop of 41% since 2000, the situation of HIV infections in AGYW still remains grim. In Africa, 74% of new HIV infections are among adolescent girls aged 15-19 (World Health Organization, 2017).

Studies show that more than 33% of the disease burden and almost 60% of premature death among adults can be associated with behaviors or conditions that began during adolescence (World Health Organization, 2021). Some adolescents, such as those in the slums or on the streets are particularly vulnerable. Data is limited on the health and risk behaviors of these adolescents. Data is needed to inform public policy and guide program and service delivery from public and non-profit providers working with youth in the slums to more strategically and efficiently target resources and interventions. A comprehensive examination of the drivers, protective factors and outcomes of high-risk sexual behaviors is critical for program and interventions among vulnerable youth. It is imperative to understand what strategies and programs are necessary for quality health services.

There is also a growing population of urban adolescents, many of whom are also considered poor and vulnerable and at high risk for HIV—namely, street children, orphans, and sex workers (Sclar et al., 2005). Despite this trend, these vulnerable populations have not received sufficient research attention and information or data on how to best address their health needs remain limited. Epidemiological surveys and surveillance data in these key populations are needed to inform and operationalize structural interventions (Parkhurst, 2014). It is clear from the preceding review that new strategies are needed to tackle the ongoing epidemic and to evaluate what has worked and not worked (Wakabi, 2008), particularly in vulnerable subgroups.

1.0.4 Growth and Significance of urban slums in sub-Saharan Africa

Eastern and Southern Africa have the highest rate of urbanization in the world and are expected to be two- thirds urbanized by 2050 (Kamndaya et al., 2015). Urbanization in this region is accompanied by rapid growth of urban slums, where approximately 60% of the current urban population resides. (United Nations Human Settlements Programme, 2010). The rapid growth of urban slums in the region is a growing concern, in part because of the high prevalence of high-risk behaviors and HIV (Magadi, 2013).

1.0.5 Slums: a structural driver of health risk factors and HIV

The growing urbanization of the world's population has led to increasing number of people residing in informal settlements commonly referred to as slums (United Nations, 2018). The term "slum" commonly refers to "an urban congested region that contains inadequate shelter, limited access to basic utilities such as water and /or sanitation, healthcare and an overall poor quality of living conditions" (Van Leeuwen et al., 2017).

The only formal definition available of a slum is the one proposed by UN-Habitat (2010), which defines a household as a slum household if it lacks any one of the following five elements: Access to improved water (access to sufficient amount of water for family use, at an affordable price, available to household members without being subject to extreme effort); access to improved sanitation (access to an excreta disposal system, either in the form of a private toilet or a public toilet shared with a reasonable number of people); durability of housing (permanent and adequate structure in nonhazardous location); sufficient living area (not more than three people sharing the same room); security of tenure (protection from evictions) (United Nations

Human Settlements Programme, 2010). All of these factors have direct consequences for the physical and psychological health of the urban population (Sclar et al., 2005).

In Uganda, 60% of the urban population live in slum dweller communities; the capital city of Kampala is home to an estimated 1.7 million people (Van Leeuwen et al., 2017). Lack of basic services in slums negatively affects health and quality of life of slum-dwellers. Material deprivation and sexual risk behavior are closely linked in studies in sub-Saharan Africa (Kamndaya et al., 2014; Mufune, 2015). The rapid growth of urban slums in the region is a cause for concern because of the high prevalence of HIV in this setting (Kamndaya et al., 2015; Kamndaya et al., 2014; Kamndaya et al., 2016; Madise et al., 2012). Previous studies focused on disadvantage, have noted the most critical factors in urban slums in sub-Saharan Africa – insufficient housing, food insecurity and poor access to healthcare (Greif et al., 2011; Kamndaya et al., 2015; Kamndaya et al., 2014; Thomas et al., 2011). In Kamndaya et al. (2014), the study found that material deprivation was significantly associated with increased odds of high sexual risk taking for young men and young women. Research from South Africa shows that the HIV prevalence in slum populations is double (or more) that in the non-slum population of the same city. As noted by Thomas and colleagues,

> *"… there is a complex interplay of upstream factors (before HIV infection) in slums, which include earlier sexual debut, lower condom use, and more partners than in non-slum areas in the same cities. A combination prevention approach, taking into account gender, education, overcrowding, food insecurity, and migration, is thus very important."* (Thomas et al., 2011).

Using nationally representative DHS data, Greif et al (2011) set forth to examine whether this empirical relationship between urban poverty and risky sexual behavior applied to five cities across the African continent: Accra (Ghana), Dar-es-Salaam (Tanzania), Harare (Zimbabwe, Kampala (Uganda) and Nairobi (Kenya). The authors pointed out that high unemployment rates and low wages in poor urban areas make women vulnerable to risky behavior, by forcing them to exchange sex and to have multiple partners for income, food and goods (Greif et al., 2011; Zulu et al., 2002). Such risky behavior increases the risk of exposure to both HIV and STIs.   The study also found that slum residents demonstrate riskier sexual behavior compared with non-slum residents. Women in slum settings across all five cities demonstrated earlier sexual debut, lower condom use and a higher incidence of multiple partnerships compared to those residing in non-slum settings. As such, we may conceptualize the slums and its context a structural driver of the HIV epidemic. Parkhurst (2014) helps explain why much of what is needed to move HIV prevention forward-- addressing broader structures, using tailored interventions and addressing multiple causal elements have been known for decades, yet has not been comprehensively executed (Parkhurst, 2014). Structural HIV prevention strategies can be challenging given that the expedience of results and the complexity of the strategy determine adoption of policies (Hunsmann, 2012).

1.0.6 Urban Slum Youth, High-Risk Behavior and Exposures

Adolescents in sub-Saharan Africa are widely recognized as one of the most important high-risk groups for HIV prevention. There is limited research on HIV transmission risk and protective factors in sub-Saharan Africa, especially among youth who live on the streets and in the slums who face much of the burden related to poverty, lack of family support as well as infectious and chronic diseases (Mufune, 2000; Swahn, Culbreth, Staton, & Kasirye, 2017).

Depending on the age groups and definitions used, there are between 100 million and 300 million street youth worldwide, most of them in low- and middle-income countries (Souza et al., 2011). Globally, poverty is the underlying cause of the high number of street children (le Roux & Smith, 1998; Sherman et al., 2005). Substance abuse, mental and physical health problems among street youth appear to be a substantial problem and the provision of scarce medical and mental healthcare presents challenges to organizations working with this vulnerable population (Souza et al., 2011).

High-risk behavior among children and adolescents living in the slums of sub-Saharan Africa is of particular concern because of their dire circumstances and unmet health needs. The urban slums of Kampala are residence to a high-risk population of youth who suffer from poverty, lack of resources, orphan status, living on streets, lack of education, mental health and sexual health disparities (Renzaho et al., 2017; Swahn, Culbreth, Staton, & Kasirye, 2017). The health risks of street children in Kampala is a particularly pressing issue due to the expectation that their numbers are expected to substantially increase as Uganda is projected to have the world's highest population growth over the next couple of decades (World Bank, 2020).

Previous research, although limited, indicates relatively high levels of interpersonal violence and physical abuse among youth in Kampala (Swahn, Culbreth, Staton, Self-Brown, et al., 2017; Swahn, Gressard, et al., 2012). In addition, research among this population of youth reported an HIV prevalence of 10.5%, much higher than the national average, alcohol use was associated with HIV and sexual risk behaviors were higher for HIV-positive youth (Swahn et al., 2019). These challenges are not surprising given that economic hardship, family conflict or disruption, abuse, and maltreatment are often predisposing contextual and lifestyle factors that result in living on the streets, in the slums, or in other compromised living situations (le Roux & Smith, 1998; Mufune, 2000; Tyler et al., 2013). Clearly, street children are exposed to high levels of poverty, family conflict, and low parental attachment, well as alcohol and drug use, which have been well established risk factors for mental health issues, alcohol-related harm, interpersonal violence and further victimization, high risk sexual behavior and increased risk for HIV infection.

1.0.7 Purpose of the three studies

The overall purpose of the three studies herein is to examine the determinants and drivers of high-risk and protective sexual behavior among these vulnerable youth in Kampala slums and to address the dearth of literature regarding such HIV-risk behavior in this population. The goals is to inform the development of targeted and sustainable programs that will address the high HIV burden among at-risk slum youth and to get us closer to zero new infections in accordance with the Uganda guidelines to end new HIV infections by 2030 (UAC, 2015).

According to the UNAIDS, *"As HIV cannot be addressed only through bio-medical approaches, the response requires simultaneous advancements in terms of sexual and reproductive health and rights, access to education and employment, social justice and gender equality. Moving forward, isolated successes require replication, and small-scale programmes that have been proven to work need to be scaled up with sustainable funding and political commitment."* (UNAIDS, 2016)

1.0.8 Summary of the Three Studies

The three studies herein are based on the "Kampala Youth Survey 2014", a cross-sectional survey conducted to quantify and examine high-risk behaviors and exposures, with a focus on alcohol use, sexual behaviors and HIV, in a convenience sample of urban youth, 12-18 years of age, living in the slums or on the streets of Kampala, Uganda, who were participating in a Uganda Youth Development Link (UYDEL) drop-in center for disadvantaged street and slum youth.

The first study will examine the correlates of consistent condom use among a sample of slum youth in Kampala, Uganda based on the Kampala Youth Survey 2014. Unprotected sex is primary risk factor for HIV transmission. Consistent condom use plays a critical role in preventing HIV transmission across populations. It is imperative to study and focus on the barriers that these youth face in high-prevalence, low resource settings in sub-Saharan Africa where the burden of HIV is the highest. Given the gap in condom use in Uganda, this first study of the correlates of condom use among urban slum youth in Kampala will aim to fill the data gap and identify barriers in this sub-population of youth. Moreover this study aims to examine the correlates of consistent condom use among sexually-active slum youth in Kampala, Uganda The guiding research questions were as follows: (1) What is the prevalence of consistent condom use among youth in the slums of Kampala? (2) Are there significant differences in characteristics between consistent and inconsistent condom users? (3) What are the correlates of consistent condom use among youth in the slums of Kampala?

The second study (Chapter 3) will examine the individual and community-level factors for engaging in multiple sexual partnerships among sexually active slum youth, ages 12-18 years. In particular, this study aims to identify whether slum location is a factor in engaging in multiple sexual partnerships. The guiding research questions were as follows: (1) What is the prevalence of having lifetime multiple sexual partners (3 or more) among slum male and female youth attending six youth centers across the slums of Kampala?; (2) Do the characteristics of youth with multiple sexual partners (three (3) or more lifetime partners) differ from those with only 1-2 lifetime sexual partners?; (3) Does having multiple sexual partners differ by the location of distinct slum communities across Kampala?; and (4) Which individual and community-level factors are significantly associated with multiple sexual partnerships among male and female youth who live in the slums of Kampala? Since many adolescents and young adults fail to use condoms correctly and consistently, the number of sexual partners they have is an important risk factor for sexually transmitted diseases, including HIV. Identifying factors that are associated with having multiple partners can help in the design of disease interventions. Prevention of HIV in adolescents and young adults is critical to the control of the pandemic overall, given that nearly half of all new infections in Uganda are among the 15-24 age group (Pilgrim et al., 2015).

The purpose of the third study (Chapter 4) is to explore patterns of sexual risk behaviors using latent class analysis (LCA) approach and then to examine socio-demographic and parental-influence covariates associated with each identified class. In addition, this study examines the association between sexual risk behavior patterns and HIV status. Latent class analysis (LCA) is a statistical methodology that can provide mathematical justification for distinct groups, or classes, through mixture modeling, and has been used to examine risk profiles of other populations at risk for HIV transmission (Mackesy-Amiti et al., 2018; Noor et al., 2014). The guiding research questions were as follows: 1) Are there identifiable groups of participants that share similar risk characteristics in their reported sexual behaviors?; 2) What are the correlates of the identified risk classes, including social and demographic characteristics, risk behaviors and parental living status and monitoring.

1.1 Methods:

Background

The three studies are based on the "Kampala Youth Survey 2014", a cross-sectional survey conducted in March and April 2014 to quantify and examine high-risk behaviors and exposures, with a focus on alcohol use, sexual behaviors and HIV, in a convenience sample of urban youth, 12-18 years of age, living in the slums or on the streets of Kampala, Uganda, who were participating in a Uganda Youth Development Link (UYDEL) drop-in center for disadvantaged street and slum youth. UYDEL serves on average 3000 youth per month through six drop-in centers throughout the slums of Kampala.

Participants and Recruitment

Each social worker and peer educator received comprehensive training on the study methodology, interpretation of each survey question and its translation into Luganda (the local language), if needed. In addition, the social workers and peer educators received training on recruitment and consent methods in order to facilitate potential participants among attendants at their specific youth drop-in center. Study participants were recruited through convenience sampling of the youth at six drop-in centers and the neighborhoods surrounding the UYDEL drop-in centers primarily through word-of-mouth. Face-to-face interviews were conducted by social workers and peer educators employed by UYDEL with previous experience working with youth within the targeted drop-in centers and communities. Over the 15-day (March 19 to April 2) survey collection period, 1628 youth were approached for participating in the survey. Among these youth, 131 declined, yielding a participation rate of 92%. A total of 1,497 surveys were collected, including 43 pilot cases. Three hundred and twenty (320) surveys were lost due to technical issues with the survey software and server, yielding 1,134 completed surveys for the final analytic sample of youth between the ages of 12 and 18 (44% boys, 56% girls). Participants were informed about the study and read (or were read to) the consent forms to indicate their willingness to take the survey. All participants provided verbal consent to participate in the study. Participation was limited to youth ages 12-18 present in-person on of the day the field visit. There were no other exclusion criteria. Recruited youth received a small snack as incentive for participating in the survey. IRB approvals were obtained from the Georgia State University and the Uganda National Council on Science and Technology to conduct this study in Kampala. The Kampala Youth Survey 2014 was administered to the participants on Google Nexus 7 tablets using survey software. The use of tablets as an "mHealth" technology allowed for easier administration of the survey and streamlined data collection. UYDEL interviewers received a one-day training on survey administration protocols and the use of the tablet. Interviewers were also assigned a tablet with a unique identifier to be used over the course of the survey administration. During training interviewers were instructed to read the survey questions exactly as they appeared on the tablet screen after obtaining consent from the participants. The tablets were programmed to notify the interviewers of any missed questions and also processed skip patterns automatically for more accurate data collection.

Survey Measures

The Kampala Youth Survey 2014 was based on previously validated quantitative measures to assess alcohol use, violence perpetration and victimization, prevalence of alcohol marketing, sexual behaviors, HIV status and mental health among adolescents. Participants were queried on demographics, alcohol usage, perception and beliefs related to alcohol and sex as well as their knowledge of HIV/AIDS and other sexually transmitted infections (STIs).

Questions included in the survey were collected from previously validated instruments used in the United States and globally to measure alcohol and sexual related behavior as well as mental health, including; Global School-based Student Health Survey (GSHS), Kampala Youth Survey 2011, MAMPA 2012 Questionnaire, CAGE Questionnaire, iMPPACS, AIDS Indicator Survey and the Demographic Health Survey. The survey was available to participants in both English and Luganda (the local language). All survey translation was conducted by a certified Luganda translator and back-translated for accuracy.

References

Ajayi, A. I., Ismail, K. O., & Akpan, W. (2019, Sep). Factors associated with consistent condom use: a cross-sectional survey of two Nigerian universities. *BMC public health, 19*(1), 1207. https://doi.org/10.1186/s12889-019-7543-1

Ajayi, A. I., & Olamijuwon, E. O. (2019). What predicts self-efficacy? Understanding the role of sociodemographic, behavioural and parental factors on condom use self-efficacy among university students in Nigeria. *PLoS One, 14*(8), e0221804. https://doi.org/10.1371/journal.pone.0221804

Baliunas, D., Rehm, J., Irving, H., & Shuper, P. (2010). Alcohol consumption and risk of incident human immunodeficiency virus infection: a meta-analysis. *International journal of public health, 55*(3), 159-166.

Bankole, A., Ahmed, F. H., Neema, S., Ouedraogo, C., & Konyani, S. (2007, Dec). Knowledge of correct condom use and consistency of use among adolescents in four countries in sub-Saharan Africa. *Afr J Reprod Health, 11*(3), 197-220. https://www.ncbi.nlm.nih.gov/pubmed/18458741

Bankole, A., Biddlecom, A., Guiella, G., Singh, S., & Zulu, E. (2007, Dec). Sexual behavior, knowledge and information sources of very young adolescents in four sub-Saharan African countries. *Afr J Reprod Health, 11*(3), 28-43. https://www.ncbi.nlm.nih.gov/pubmed/18458739

Bronfenbrenner, U. (1979). *The ecology of human development*. Harvard university press.

Cecil, H., Pinkerton, S. D., Bogart, L. M., Pavlovic, J., & Kimball, A. M. (2005, Nov). An empirical study of ordinal condom use measures. *J Sex Res, 42*(4), 353-358. https://doi.org/10.1080/00224490509552291

Cederbaum, J. A., Gilreath, T. D., & Barman-Adhikari, A. (2014, Dec). Perceived risk and condom use among adolescents in sub-Saharan Africa: a latent class analysis. *Afr J Reprod Health, 18*(4), 26-33. https://www.ncbi.nlm.nih.gov/pubmed/25854090

Coldiron, M. E., Stephenson, R., Chomba, E., Vwalika, C., Karita, E., Kayitenkore, K., Tichacek, A., Isanhart, L., Allen, S., & Haworth, A. (2008, Jul). The relationship between alcohol consumption and unprotected sex among known HIV-discordant couples in Rwanda and Zambia. *AIDS Behav, 12*(4), 594-603. https://doi.org/10.1007/s10461-007-9304-x

Crosby, R. A., DiClemente, R. J., Wingood, G. M., Lang, D., & Harrington, K. F. (2003, Jun). Value of consistent condom use: a study of sexually transmitted disease prevention among African American adolescent females. *Am J Public Health, 93*(6), 901-902. https://doi.org/10.2105/ajph.93.6.901

Dietrich, J., Sikkema, K., Otwombe, K. N., Sanchez, A., Nkala, B., de Bruyn, G., Van Der Watt, M., & Gray, G. E. (2013, Jul 1). Multiple levels of influence in predicting sexual activity and condom use among adolescents in Soweto, Johannesburg, South Africa. *J HIV AIDS Soc Serv, 12*(3-4), 404-423. https://doi.org/10.1080/15381501.2013.819312

Espada, J. P., Morales, A., Guillén-Riquelme, A., Ballester, R., & Orgilés, M. (2016, 2016/01/14). Predicting condom use in adolescents: a test of three socio-cognitive models using a structural equation modeling approach. *BMC public health, 16*(1), 35. https://doi.org/10.1186/s12889-016-2702-0

Fatusi, A., & Wang, W. (2009, Apr). Multiple sexual partnership mediates the association between early sexual debut and sexually transmitted infection among adolescent and young adult males in Nigeria. *Eur J Contracept Reprod Health Care, 14*(2), 134-143. https://doi.org/10.1080/13625180802601110

Fisher, J. C. (2010, 2010/06/01). Can we engage the alcohol industry to help combat sexually transmitted disease? *International journal of public health, 55*(3), 147-148. https://doi.org/10.1007/s00038-010-0142-7

Greif, M. J., Dodoo, F. N., & Jayaraman, A. (2011). Urbanisation, poverty and sexual behaviour: the tale of five African cities. *Urban Stud, 48*(5), 947-957. https://doi.org/10.1177/0042098010368575

Hunsmann, M. (2012). Limits to evidence-based health policymaking: policy hurdles to structural HIV prevention in Tanzania. *Social science & medicine, 74*(10), 1477-1485.

Jama Shai, N., Jewkes, R., Levin, J., Dunkle, K., & Nduna, M. (2010, Nov). Factors associated with consistent condom use among rural young women in South Africa. *AIDS care, 22*(11), 1379-1385. https://doi.org/10.1080/09540121003758465

Kalichman, S. C., Simbayi, L. C., Kaufman, M., Cain, D., & Jooste, S. (2007). Alcohol use and sexual risks for HIV/AIDS in sub-Saharan Africa: systematic review of empirical findings. *Prevention science, 8*(2), 141.

Kamndaya, M., Kazembe, L. N., Vearey, J., Kabiru, C. W., & Thomas, L. (2015, May). Material deprivation and unemployment affect coercive sex among young people in the urban slums of Blantyre, Malawi: A multi-level approach. *Health Place, 33*, 90-100. https://doi.org/10.1016/j.healthplace.2015.03.001

Kamndaya, M., Thomas, L., Vearey, J., Sartorius, B., & Kazembe, L. (2014, Jun). Material deprivation affects high sexual risk behavior among young people in urban slums, South Africa. *J Urban Health, 91*(3), 581-591. https://doi.org/10.1007/s11524-013-9856-1

Kamndaya, M., Vearey, J., Thomas, L., Kabiru, C. W., & Kazembe, L. N. (2016, Mar). The role of material deprivation and consumerism in the decisions to engage in transactional sex among young people in the urban slums of Blantyre, Malawi. *Glob Public Health, 11*(3), 295-308. https://doi.org/10.1080/17441692.2015.1014393

Kumar, S., Culbreth, R. E., Swahn, M. H., & Kasirye, R. (2020). Examining correlates of alcohol related condom-less sex among youth living in the slums of Kampala, Uganda. *AIDS care, 32*(10), 1246-1250.

le Roux, J., & Smith, C. S. (1998, Fall). Causes and characteristics of the street child phenomenon: a global perspective. *Adolescence, 33*(131), 683-688. https://www.ncbi.nlm.nih.gov/pubmed/9831885

Mackesy-Amiti, M. E., Boodram, B., Handanagic, S., Paz-Bailey, G., Prachand, N. G., Broz, D., & Group, N. S. (2018, Nov 1). Latent Classes of Sexual Risk Behavior and Engagement in Outreach, Intervention and Prevention Services Among Women Who Inject Drugs Across 20 US Cities. *J Acquir Immune Defic Syndr, 79*(3), 305-314. https://doi.org/10.1097/QAI.0000000000001816

Madise, N. J., Ziraba, A. K., Inungu, J., Khamadi, S. A., Ezeh, A., Zulu, E. M., Kebaso, J., Okoth, V., & Mwau, M. (2012, Sep). Are slum dwellers at heightened risk of HIV infection than other urban residents? Evidence from population-based HIV prevalence surveys in Kenya. *Health Place, 18*(5), 1144-1152. https://doi.org/10.1016/j.healthplace.2012.04.003

Magadi, M. A. (2013, Jun). The disproportionate high risk of HIV infection among the urban poor in sub-Saharan Africa. *AIDS Behav, 17*(5), 1645-1654. https://doi.org/10.1007/s10461-012-0217-y

Mehra, D., Ostergren, P. O., Ekman, B., & Agardh, A. (2014). Inconsistent condom use among Ugandan university students from a gender perspective: a cross-sectional study. *Glob Health Action, 7*, 22942. https://doi.org/10.3402/gha.v7.22942

Ministry of Health. (2017). *Adolescent Health Risk Behaviors in Uganda: A National Cross Sectional Study 2017*. M. o. Health. http://library.health.go.ug/publications/adolescent-health/adolescent-health-risk-behaviors-uganda-national-cross-sectional

Muchiri, E., Odimegwu, C., Banda, P., Ntoimo, L., & Adedini, S. (2017, Jul). Ecological correlates of multiple sexual partnerships among adolescents and young adults in urban Cape Town: a cumulative risk factor approach. *Afr J AIDS Res, 16*(2), 119-128. https://doi.org/10.2989/16085906.2017.1318762

Mufune, P. (2000). Street youth in southern Africa. *International Social Science Journal, 52*(164), 233-243.

Mufune, P. (2015). Poverty and HIV/AIDS in Africa: Specifying the connections. *Social Theory & Health, 13*(1), 1-29.

Noor, S. W., Ross, M. W., Lai, D., & Risser, J. M. (2014, Apr). Use of latent class analysis approach to describe drug and sexual HIV risk patterns among injection drug users in Houston, Texas. *AIDS Behav, 18 Suppl 3*, 276-283. https://doi.org/10.1007/s10461-014-0713-3

Parkhurst, J. O. (2014). Structural approaches for prevention of sexually transmitted HIV in general populations: definitions and an operational approach. *J Int AIDS Soc, 17*, 19052. https://doi.org/10.7448/IAS.17.1.19052

Pilgrim, N. A., Ahmed, S., Gray, R. H., Sekasanvu, J., Lutalo, T., Nalugoda, F., Serwadda, D., & Wawer, M. J. (2015, Aug). Multiple sexual partnerships among female adolescents in rural Uganda: the effects of family structure and school attendance. *Int J Adolesc Med Health, 27*(3), 319-328. https://doi.org/10.1515/ijamh-2014-0032

Renzaho, A. M., Kamara, J. K., Georgeou, N., & Kamanga, G. (2017). Sexual, Reproductive Health Needs, and Rights of Young People in Slum Areas of Kampala, Uganda: A Cross Sectional Study. *PLoS One, 12*(1), e0169721. https://doi.org/10.1371/journal.pone.0169721

Reynolds, H. W., Luseno, W. K., & Speizer, I. S. (2013). Consistent condom use among men with non-marital partners in four sub-Saharan African countries. *AIDS care, 25*(5), 592-600. https://doi.org/10.1080/09540121.2012.726340

Santelli, J. S., DiClemente, R. J., Miller, K. S., & Kirby, D. (1999, Feb). Sexually transmitted diseases, unintended pregnancy, and adolescent health promotion. *Adolesc Med, 10*(1), 87-108, vi. https://www.ncbi.nlm.nih.gov/pubmed/10086168

Sclar, E. D., Garau, P., & Carolini, G. (2005, Mar 5-11). The 21st century health challenge of slums and cities. *Lancet*, *365*(9462), 901-903. https://doi.org/10.1016/S0140-6736(05)71049-7

Scribner, R., Theall, K. P., Simonsen, N., & Robinson, W. (2010). HIV risk and the alcohol environment: advancing an ecological epidemiology for HIV/AIDS. *Alcohol Res Health*, *33*(3), 179-183. https://www.ncbi.nlm.nih.gov/pubmed/23584059

Sherman, S. S., Plitt, S., ul Hassan, S., Cheng, Y., & Zafar, S. T. (2005, Sep). Drug use, street survival, and risk behaviors among street children in Lahore, Pakistan. *J Urban Health*, *82*(3 Suppl 4), iv113-124. https://doi.org/10.1093/jurban/jti113

Siziya, S., Muula, A. S., Kazembe, L. N., & Rudatsikira, E. (2008, Feb 11). Harmful lifestyles' clustering among sexually active in-school adolescents in Zambia. *BMC Pediatr*, *8*, 6. https://doi.org/10.1186/1471-2431-8-6

Souza, R., Porten, K., Nicholas, S., Grais, R., & Medecins Sans Frontieres-Honduras, t. (2011, Nov). Outcomes for street children and youth under multidisciplinary care in a drop-in centre in Tegucigalpa, Honduras. *Int J Soc Psychiatry*, *57*(6), 619-626. https://doi.org/10.1177/0020764010382367

Swahn, M. H., Culbreth, R., Salazar, L. F., Tumwesigye, N. M., & Kasirye, R. (2019). Psychosocial correlates of self-reported HIV among youth in the slums of Kampala. *BMC public health*, *19*(1), 1176.

Swahn, M. H., Culbreth, R., Staton, C. A., & Kasirye, R. (2017). Psychosocial health concerns among service-seeking orphans in the slums of Kampala. *Vulnerable children and youth studies*, *12*(3), 258-263.

Swahn, M. H., Culbreth, R. E., Staton, C. A., Self-Brown, S. R., & Kasirye, R. (2017). Alcohol-related physical abuse of children in the slums of Kampala, Uganda. *International Journal of Environmental Research and Public Health*, *14*(10), 1124.

Swahn, M. H., Gressard, L., Palmier, J. B., Kasirye, R., Lynch, C., & Yao, H. (2012). Serious violence victimization and perpetration among youth living in the slums of Kampala, Uganda. *Western journal of emergency medicine*, *13*(3), 253.

Thomas, L., Vearey, J., & Mahlangu, P. (2011, May 7). Making a difference to health in slums: an HIV and African perspective. *Lancet*, *377*(9777), 1571-1572. https://doi.org/10.1016/S0140-6736(11)60642-9

Toska, E., Pantelic, M., Meinck, F., Keck, K., Haghighat, R., & Cluver, L. (2017). Sex in the shadow of HIV: A systematic review of prevalence, risk factors, and interventions to reduce sexual risk-taking among HIV-positive adolescents and youth in sub-Saharan Africa. *PLoS One*, *12*(6), e0178106. https://doi.org/10.1371/journal.pone.0178106

Tyler, K. A., Gervais, S. J., & Davidson, M. M. (2013). The relationship between victimization and substance use among homeless and runaway female adolescents. *Journal of interpersonal violence, 28*(3), 474-493.

UAC. (2015). *National HIV and AIDS Strategic Plan 2015/2016-2019/2020*. Uganda AIDS Commission, Republic of Uganda. Retrieved January 18, 2021 from https://www.childrenandaids.org/index.php/Uganda_National-HIV-and-AIDS-Strategic-Plan_2015

Uganda Bureau of Statistics - UBOS, & ICF. (2018). *Uganda Demographic and Health Survey 2016*. http://dhsprogram.com/pubs/pdf/FR333/FR333.pdf

Uganda Ministry of Health. (2012). *2011 Uganda AIDS Indicator Survey: Key Findings*. ICF International Retrieved May 7, 2020 from https://health.go.ug/docs/UAIS_2011_REPORT.pdf

Uganda Ministry of Health. (2019). *Uganda population-based HIV impact assessment (UPHIA) 2016–2017*. http://uac.go.ug/sites/default/files/UPHIA%20Final%20Report%20%5B2016%20-%202017%5D.pdf

UNAIDS. (2016). *Prevention Gap Report*. World Health Organization. https://www.unaids.org/sites/default/files/media_asset/2016-prevention-gap-report_en.pdf

UNAIDS. (2019). *AIDSinfo*. https://aidsinfo.unaids.org/

UNAIDS. (2020). *Global AIDS update 2020*. World Health Organization. Retrieved January 25, 2020 from https://www.unaids.org/sites/default/files/media_asset/2020_global-aids-report_en.pdf

United Nations. (2018). *World Urbanization Prospects: The 2018 Revision*. Department of Economic and Social Affairs Population Division. https://population.un.org/wup/Publications/Files/WUP2018-KeyFacts.pdf

United Nations Human Settlements Programme. (2010). *State of the world's cities 2010/2011: Bridging the urban divide*. Earthscan.

Valadez, J. J., Jeffery, C., Davis, R., Ouma, J., Lwanga, S. K., & Moxon, S. (2014). Putting the C back into the ABCs: a multi-year, multi-region investigation of condom use by Ugandan youths 2003-2010. *PLoS One, 9*(4), e93083. https://doi.org/10.1371/journal.pone.0093083

Van Leeuwen, J. M., Sekeramayi, T., Martell, C., Feinberg, M., & Bowersox-Daly, S. (2017). A baseline analysis of the Katanga slums: informing urban public policy in Kampala, Uganda. *African Population Studies, 31*(2).

Wakabi, W. (2008, Feb). Low ART adherence in Africa. *Lancet Infect Dis, 8*(2), 94. https://doi.org/10.1016/s1473-3099(08)70010-0

Warren, C. W., Santelli, J. S., Everett, S. A., Kann, L., Collins, J. L., Cassell, C., Morris, L., & Kolbe, L. J. (1998, Jul-Aug). Sexual behavior among U.S. high school students, 1990-1995. *Fam Plann Perspect, 30*(4), 170-172, 200. https://www.ncbi.nlm.nih.gov/pubmed/9711454

Weiser, S. D., Leiter, K., Heisler, M., McFarland, W., Percy-de Korte, F., DeMonner, S. M., Tlou, S., Phaladze, N., Iacopino, V., & Bangsberg, D. R. (2006). A population-based study on alcohol and high-risk sexual behaviors in Botswana. *PLoS Med, 3*(10), e392.

World Bank. (2020). *Tackling the Demographic Challenge in Uganda*. World Bank. https://openknowledge.worldbank.org/handle/10986/34676

World Health Organization. (2017). *The importance of sexual and reproductive health and rights to prevent HIV in adolescent girls and young women in eastern and southern Africa*. https://www.who.int/reproductivehealth/publications/linkages/hiv-prevention-adolescent-girls-young-women/en/

World Health Organization. (2021). *Adolescent Health and Development*. https://www.who.int/news-room/q-a-detail/adolescent-health-and-development

Zulu, E. M., Dodoo, F. N., & Chika-Ezee, A. (2002, Nov). Sexual risk-taking in the slums of Nairobi, Kenya, 1993-8. *Popul Stud (Camb), 56*(3), 311-323. https://doi.org/10.1080/00324720215933

Chapter 2

Paper 1. Correlates of Consistent Condom Use among Vulnerable Youth in the Slums of Kampala, Uganda

2.0 Introduction

An estimated 1.5 million people in Uganda are living with HIV (UNAIDS, 2020) . The estimated HIV prevalence among adults in Uganda (aged 15 to 49) is 6.2% (Uganda Ministry of Health, 2019; UNAIDS, 2019). Annual new infections are projected to grow from 52,000 in 2016 to 340,000 in 2025 (UAC, 2015). Women are disproportionately affected, with 8.8% of adult women living with HIV compared to 4.3% of men (Uganda Ministry of Health, 2019). Uganda is country with a very high population growth, facing high rates of urbanization with urban slums with limited resources and infrastructure (United Nations, 2018; Van Leeuwen et al., 2017). Uganda also has a large youth population with half of the population under the age of 15 (Ministry of Health, 2017). Youth in the slums of Kampala face lack of resources, lack of parents and homelessness (Lyons et al., 2017; Self-Brown et al., 2018) psychosocial distress (Perry et al., 2020), high prevalence of HIV and STIs (Culbreth et al., 2020; Swahn et al., 2019), suicidality (Culbreth et al., 2018; Swahn, Palmier, et al., 2012), violence (Swahn, Gressard, et al., 2012), and alcohol use and problem drinking (Swahn et al., 2020).

High-risk sexual behaviors among youth increase the risk of acquiring HIV and other sexually transmitted diseases (Muchiri et al., 2017; Santelli et al., 1999; Warren et al., 1998). Unprotected sex is a primary risk factor for HIV transmission. Condom use plays a critical role in preventing HIV transmission across populations. The Uganda Population-based HIV Impact Assessment (UPHIA) reported that among sexually active adults who reported sexual intercourse with a non-marital, non-cohabitating partner in the 12 months preceding the survey, nearly two-thirds reported *not* using a condom at last sexual intercourse with such a partner (Uganda Ministry of Health, 2019).

Consistent condom use plays a critical and key role in preventing HIV transmission globally. Vulnerable youth, especially girls aged 15-24 years face a disturbingly high risk of HIV infection. In sub-Saharan Africa, young women accounted for 25% of the new HIV infections among adults (UNAIDS, 2016). It is imperative to study and focus on the barriers that these youth face in high-prevalence, low resource settings in sub-Saharan Africa where the burden of HIV is the highest.

Condoms effectively prevent HIV and other STIs and are cost-effective and are the foundation of a combination HIV prevention approach. Uganda's 2011 National AIDS Indicator survey reported declining rates of condom use during higher risk sexual encounters (Uganda Ministry of Health, 2012). There was an observed decline in the proportion of married and co-habiting individuals who used condoms, with 54% reporting condom use in the last casual sex encounter in 2013 compared to 71% in 2011. The number of male condoms distributed by the government rose from 87 million in 2012 to around 230 million by the end of 2015. However, this is far below the number of condoms required, given the population size. As UNAIDS has recommended, a coordinated approach to consistent condom use is an integral element in preventing the transmission of HIV in Uganda.

The urgency for preparing even young adolescents with adequate and correct knowledge on how to protect themselves from STIs and pregnancy is warranted by the finding that among youth, 12 to 14 years of age, at least 3 in 10 of 12–14 year old girls and boys in Uganda engage in some form of intimate sexual activity (sexual intercourse, kissing, fondling, or they have had a boyfriend or girlfriend)(Bankole, Biddlecom, et al., 2007). Adolescents in sub-Saharan Africa are confronted with multiple behavioral, physiological and socio-cultural factors known to contribute to their vulnerability to sexual and reproductive health issues. These include: lack of awareness, inaccurate knowledge about contraception and sexually transmitted infections [STIs], peer and societal norms that do not deter youth from engaging in unprotected sex, multiple sex partners, lack of personal control over resisting sex or practicing safe sex, lack of age appropriate sexual health counseling services, and poverty (Cederbaum et al., 2014).

Bankole, Ahmed, Neema, Ouedraogo & Konyani (2007) noted that it is clear that both risks of HIV and unwanted pregnancy are real among adolescents in Sub-Saharan Africa. For young people who are sexually active, besides sex with one uninfected partner, the condom, is the only method that offers protection against HIV and some other STIs. Additionally, it has been shown that the condom is an effective method of preventing unwanted pregnancy, and it is certainly the most preferred method among unmarried young people. However, there is a consensus in the literature on condom promotion and use for HIV prevention in developing countries, that only consistent use of the condom offers effective protection against HIV (Crosby et al., 2003).

To develop effective and appropriate health promotion programs for adolescents in low resource settings within sub-Saharan Africa, it is critical to understand context-specific factors that influence condom use. Adolescent sexuality and sexual risk are influenced at multiple levels and can be explained through ecological systems theory (Bronfenbrenner, 1979; Toska et al., 2017): the individual (microsystem), family, peers and relationships (mesosystem), the larger social systems, such as the community, which dictate social norms and expectations (exosystem), and, last, the rules and legislation that govern society and affect adolescents (macrosystem), which provides a conceptual framework to examine HIV risk among adolescents in a low-resource sub-Saharan setting (Dietrich et al., 2013).

An ecological epidemiology of HIV risk place individual-level risk factors at the base of the multiple levels. Alcohol consumption and high-risk sexual behaviors, including sex without a condom, multiple sex partners and transactional sex are individual risk behaviors, but may be affected by the neighborhood environment and societal level policies (Scribner et al., 2010). Research studies of this youth population have reported HIV prevalence of 10.5%, much higher than the national average, and that alcohol use was associated with HIV and sexual risk behaviors were higher for those HIV-positive youth (Swahn et al., 2019).

In a 2014 study of 4518 sexually active youth interviewed at five time points (2003–2010) in up to 23 districts located across Uganda, Valadez and colleagues (2014) measured the association of condom use at first sexual intercourse on recent condom use. The odds of consistently using a condom were 11.12 times more likely for those individuals using condoms during their sexual debut, than those who did not. The results suggest that HIV prevention programs should encourage condom use among youth during sexual debut (Valadez et al., 2014).

Studies have found that, at the individual level, young people’s perceptions of condoms tend to be negative and will affect condom use. Studies have also documented that young people have concerns about condom safety and breakage, condom ineffectiveness (e.g., condoms have small holes or they can disappear into the vagina), the negative effect of condom use on sexual enjoyment, the low quality of condoms, especially condoms that are free, and condom use signifying infidelity or having an STI (Bankole, Ahmed, et al., 2007). However, studies have reported that consistent condom use was associated with higher condom use self-efficacy (Mehra et al., 2014) and knowing one’s HIV status (Jama Shai et al., 2010). Key direct predictors of frequent condom use in adolescents include condom use intention, attitudes toward condom use and subjective norms related to condom use and self-efficacy (Espada et al., 2016). In a study using nationally representative data collected through household-based surveys of adolescents 12-19 years in Uganda, found that condom use was associated with a five-fold increase in the likelihood of being in the 'High perceived risk with AIDS' compared to the 'Low perceived risk with no AIDS' class (OR=5.10, 95% CI=2.14-12.17) (Cederbaum et al., 2014).

Similarly, Bankole and colleagues (2007) reported that the proportion of youth reporting consistent use of the condom use in the past three months preceding the survey was 36% in Uganda. This study also showed that sex education was another important predictor of consistent condom use. In addition, urban residence, living with parents and higher level of education, have been shown to be positively associated with consistent condom use. These predictors may be due to greater access to information and contraceptive methods, particularly condoms (Bankole, Ahmed, et al., 2007).

Given the challenges of poverty and hardship among vulnerable youth in Kampala, the increased likelihood of engaging in risky behaviors and the high prevalence of HIV among this population (Swahn et al., 2019), it is critical to determine the correlates of consistent condom use among these youth. It is imperative to fill the evidence gap and to develop effective interventions and programmatic strategies to increase the prevalence of such protective behavior and curb transmission of HIV among these vulnerable and under-studied youth. Given unprotected sex as the primary risk factor for HIV transmission, understanding the modifiable correlates of consistent condom use among youth living across the slums of Uganda will address an unaddressed gap in the literature.

Study Aims and Research Questions

This study aims to examine the individual-level correlates of consistent condom use among sexually-active slum youth in Kampala, Uganda. The guiding research questions were as follows: (1) What is the prevalence of consistent condom use among youth in the slums of Kampala? (2) Are there significant differences in the psychosocial correlates of consistent and inconsistent condom use? (3) What sexual behaviors and knowledge, attitudes and norms are associated with consistent condom use?

2.1 Methods

The current study is based on the "Kampala Youth Survey 2014", a cross-sectional survey conducted in March and April 2014 to quantify and examine high-risk behaviors and exposures, with a focus on alcohol use, sexual behaviors and HIV, in a convenience sample of urban youth, 12-18 years of age, living in the slums or on the streets of Kampala, Uganda, who were participating in a Uganda Youth Development Link (UYDEL) drop-in center for disadvantaged street and slum youth. UYDEL serves on average 3000 youth per month through six drop-in centers throughout the slums of Kampala.

Participants and Recruitment

Each social worker and peer educator received comprehensive training on the study methodology, interpretation of each survey question and its translation into Luganda (the local language), if needed. In addition, the social workers and peer educators received training on recruitment and consent methods in order to facilitate potential participants among attendants at their specific youth drop-in center. Study participants were recruited through convenience sampling of the youth at six drop-in centers and the neighborhoods surrounding the UYDEL drop-in centers primarily through word-of-mouth. Face-to-face interviews were conducted by social workers and peer educators employed by UYDEL with previous experience working with youth within the targeted drop-in centers and communities. Over the 15-day (March 19 to April 2) survey collection period, 1628 youth were approached for participating in the survey. Among these youth, 131 declined, yielding a participation rate of 92%. A total of 1,497 surveys were collected, including 43 pilot cases. Three hundred and twenty (320) surveys were lost due to technical issues with the survey software and server, yielding 1,134 completed surveys for the final analytic sample of youth between the ages of 12 and 18 (44% boys, 56% girls). Participants were informed about the study and read (or were read to) the consent forms to indicate their willingness to take the survey. All participants provided verbal consent to participate in the study. Participation was limited to youth ages 12-18 present in-person on of the day the field visit. There were no other exclusion criteria. Recruited youth received a small snack as incentive for participating in the survey. IRB approvals were obtained from the Georgia State University and the Uganda National Council on Science and Technology to conduct this study in Kampala. The Kampala Youth Survey 2014 was administered to the participants on Google Nexus 7 tablets using survey software. The use of tablets as an "mHealth" technology allowed for easier administration of the survey and streamlined data collection. UYDEL interviewers received a one-day training on survey administration protocols and the use of the tablet. Interviewers were also assigned a tablet with a unique identifier to be used over the course of the survey administration. During training interviewers were instructed to read the survey questions exactly as they appeared on the tablet screen after obtaining consent from the participants. The tablets were programmed to notify the interviewers of any missed questions and also processed skip patterns automatically for more accurate data collection.

Survey Measures

The Kampala Youth Survey 2014 was based on previously validated quantitative measures to assess alcohol use, violence perpetration and victimization, prevalence of alcohol marketing, sexual behaviors and mental health among adolescents and has been previously described (Swahn et al., 2019).   Participants were queried on demographics, alcohol usage, perception and beliefs related to alcohol and sex as well as their knowledge of HIV/AIDS and other sexually transmitted infections (STIs). Questions included in the survey were collected from previously validated instruments used in the United States and globally to measure alcohol and sexual related behavior as well as mental health, including; Global School-based Student Health Survey (GSHS), Kampala Youth Survey 2011, MAMPA 2012 Questionnaire, CAGE Questionnaire, iMPPACS, AIDS Indicator Survey and the Demographic Health Survey. The survey was available to participants in both English and Luganda (the local language). All survey translation was conducted by a certified Luganda translator and back-translated for accuracy.

For the purposes of this study, inclusion was limited to those male and female participants, 12-18 years of age, who reported that they have ever had sexual intercourse if they answered “yes” to the following question: “Have you ever had sexual intercourse ?”

Measures

Dependent variable: Consistent Condom Use. A youth was classified as engaging in consistent condom use if he or she answered “Always” to the following question:

In the past three months, how often did you or your partner use a condom when having sexual intercourse? (1=Never, 2=Sometimes, 3=Most of the time, 4=Always). This variable was dichotomized as "Yes" (1=Consistent, 0=Inconsistent). If the participants reported to have used condoms "always" in the past three months then they are classified as consistent condom users. If participants reported never, sometimes or most of the time, then they are classified as inconsistent condom users.

This choice of measure as the dependent variable is supported as follows: Only consistent use of the condom has been found to offer effective protection against HIV infection. However, due to paucity of data, little is known about how consistently young people use the condom, especially in understudied slum youth. Fatusi & Wang (2009) noted that variables measuring consistent condom use better represent usual condom use behavior compared to the use of condom use at last sex (Fatusi & Wang, 2009). In addition, per the Cecil et al. (2005) study of ordinal condom use measures, the use of "always" as the outcome measure may mitigate the subjectivity of ordinal condom use frequency measures (Cecil et al., 2005). For a 2013 condom use study, ''condom always used with any partner in the last 12 months'' was also used as a measure of consistent condom use. (Reynolds et al., 2013). Finally, the feasibility of using the original ordinal condom use measure was tested, but the data did not satisfy the assumptions for such statistical analysis.

Independent Variables

Based on the review of the previous literature and the conceptual framework, the primary independent variables to be used in the analyses are set forth below in Table 1. The data are arranged into three individual-level factor domains: socio-demographics, sexual behaviors and status, and knowledge/attitudes/norms.

Table 1. Wording of Measures

Variable	Survey Question	Response Choices	Computed Variable
Gender	What is your sex?	Boy, Girl	"Gender" 0= Boy 1= Girl
Age	How old are you?	12 years, 13, 14, 15, 16, 17, 18	"Agecat" 0=12-14 1=15-16 2=17-18
Education	What level of education did you complete?	Never been to school, Primary, Secondary, Tertiary, Some Primary, Some Secondary	"Qschool" 0-Primary or less 1-Completed Primary 2-Secondary or more
Religion	What is your religion?	Christian-Catholic Christian-Other Muslim African Traditional Other	"Religion" 0- Christian-Catholic 1- Christian-Other 2 - Muslim 3- African Traditional/Other
Ever lived on Streets	Have you ever lived on the streets with no other place to go?	Yes, No	"Livedstreets" 0- No 1- Yes
Parental Living Status	Are one or both of your parents alive?	Both alive Both dead, One alive	"Parentsdead" 0- Both alive 1- Both dead, 2- One alive
Slum Location	UYDEL Youth Center location	Bwaise Kamwokya Makindye Nakulabye Nateete Mukono	"Location" 0- Bwaise 1- Kamwokya 2- Makindye 3- Nakulabye 4- Nateete 5- Mukono

Consistent Condom Use	In the past three months, how often did you or your partner use a condom when having sexual intercourse?	Never, Sometimes, Most of the time, Always	“ccur” 1- Consistent = Always 2- Inconsistent = Never, Sometimes, Most of the time,
Condom Use First Sex	Did you use a condom the first time you had sexual intercourse?	Yes, No	“condomfirst” 0- No 1- Yes
Alcohol Before Sex	Do you or your partners drink alcohol before having sexual intercourse?	Yes, No	“alcohol_sex” 0- No 1- Yes
Age at Sexual Debut	How old were you when you had sexual intercourse for the first time?	<12, 13-14, 15-16, 17-18	“agefirstsexR” 0- < 15 1- ≥ 15
Lifetime Sexual Partners	With how many different partners have you had sexual intercourse in your lifetime	None, 1-2 partners, 3-4 partners, 5-6 partners, More than 6	“sexpartners3” 2 or fewer (≤ 2) 3 or more (≥ 3)
Traded Sex	Have you ever gotten money, food, or other things for having sexual intercourse with someone?	Yes, No	“transactsex” 0- No 1- Yes
HIV-positive	Have you been told by a doctor/nurse or HIV counselor that you have HIV?	Yes, No	“QHIV” 0-No 1-Yes
Condoms Prevent HIV	If you are going to have sex,	Agree, Neither Agree/Disagree, Disagree	“condomhiv” 1- Yes = “Agree”

	condoms help to prevent HIV		2- No = “Disagree” or “Neither Agree nor Disagree”
Condom education	Has anyone ever told or shown you how to use a condom	Yes, No	“condomlearn” 1- Yes 0- No
Condom use self-efficacy	I am able to use a condom correctly	Agree, Neither Agree/Disagree, Disagree	“condomcorrect” 1- Yes = “Agree” 0- No = “Disagree” or “Neither Agree nor Disagree”
Condoms pleasure	Condoms take away the pleasure of sex	Agree, Neither Agree/Disagree, Disagree	“condompleasure” 1- Yes = “Agree” 0- No = “Disagree” or “Neither Agree nor Disagree”
Plan to use condom	I plan to use a condom when I have sexual intercourse	Agree, Neither Agree/Disagree, Disagree	“condomplan” 1- Yes = “Agree” 0- No = “Disagree” or “Neither Agree nor Disagree”
Parents promote condoms	My parents think I should carry a condom if I plan to have sex	Agree, Neither Agree/Disagree, Disagree	“condomparents” 1- Yes = “Agree” 0- No = “Disagree” or “Neither Agree or Disagree”

For the purposes of this study, socio-demographic variables included *sex, age, education, religion, ever lived on the streets, parental living status and slum location.* *Sex* was dichotomized as male/female. *Age* was treated as a categorical variable with three age categories: 12-14 years, 15-16 years and 17-18 years. *Education* was categorized as Primary or less, Completed Primary and Secondary or higher categories. *Ever lived on streets* was assessed by the question "Have you ever lived on the streets with no other place to go?" Assessing *parental living status* was based on "Are one for both of your parents alive?" Participants could answer both parents are alive, both parents are dead, one parent is alive. *Slum location* was assessed by the question "This survey is taken at the following UYDEL location" and answered by the interviewer. Responses included the following: Bwaise, Kamwokya, Makindye, Nakulabye, Nateete and Mukono.

Condom use first sex was assessed using "Did you use a condom the first time you had sex?" *Alcohol before sex* was assessed by the two questions: "Do you drink alcohol before having sexual intercourse?" and "Do your partners normally drink alcohol before having sexual intercourse with you?" *Age at sexual debut* was measured using "How old were you when you had sexual intercourse for the first time?" and will be categorized as younger than 15 years of age and 15 years of age and greater. *Lifetime sexual partners* was assessed using "With how many different partners have you had sexual intercourse in your lifetime?" Possible response categories were "None", "1-2 partners", "3-4 partners", "5-6 partners" and will be recategorized into two response levels: "fewer than 3 partners" and "3 or more partners". *Traded sex* was assessed using "Have you ever gotten money, food, or other things for having sexual intercourse with someone?" *HIV positive* was measured using "Have you been told by a doctor/nurse or HIV counselor that you have HIV?"

Condoms prevent HIV was measured using “If you are going to have sex, condoms help to prevent HIV”. *Condom education* was assessed with the question “Has anyone ever told or shown you how to use a condom”. Both *Condoms prevent HIV* and *Condom education* had possible yes or no response categories. *Condom use self-efficacy* was measured using “I am able to use a condom correctly”, *Condoms unpleasant* was measured using the question “Condoms take away the pleasure of sex. *Plan to use condom* was measured by the question “I plan to use a condom when I have sexual intercourse.*”* *Parents promote condoms* was assessed with the statement “My parents think I should carry a condom if I plan to have sex”. Participants could answer “Agree” “Neither Agree or Disagree “or “Disagree” to these four statements. The variables are coded as categorical variables defined as “yes” = agree and “no” = “Disagree” or ““Neither Agree or Disagree”.

Data Analysis

Data was coded and entered into SAS 9.4 for statistical analysis. Descriptive statistics were computed for demographic, risk behavior and socio-cognitive characteristics among consistent and inconsistent condom users. Chi-square tests were performed to determine statistically significant differences of demographic, risk behavior, and socio-cognitive characteristics between consistent and inconsistent condom use ($p<0.05$). The Fisher Exact Test was used for variables with expected cell sizes less than five (Table 2). Finally, bivariate and multivariable logistic regression analyses were conducted to determine the statistically significant factors related to reported consistent condom use. Odds ratios and 95% confidence intervals are reported from the bivariate and multivariable analyses. Those variables with a statistical significance of $p < 0.05$ were manually selected for the final multivariable model. This final multivariable model also controlled for socio-demographic variables.. Gender was conceptualized as an effect modifier through a series of interaction tests.(gender*each demographic, risk behavior and socio-cognitive predictor variable).

Table 2. Characteristics of Consistent versus Inconsistent Condom Use among Sexually Active Kampala Youth, ages 12-18 (*n* =590)

Characteristics	Consistent Condom Use *n* (%) 145 (24.58)	Inconsistent Condom Use *n* (%) 445 (75.42)	Total Sample *n* (%) 590 (100)	Chi-square, *df*, *p*-value
Socio-demographic				
Sex				
Female	90 (62.07)	256 (57.53)	346 (58.64)	0.93, (*1*), *p = 0.33*
Male	55 (37.93)	189 (42.5)	244 (41.36)	
Age				
12-14	2 (1.38)	29 (6.52)	31 (5.25)	
15-16	24 (16.55)	107 (24.04)	131 (22.20)	***p = 0.0034****
17-18	119 (82.07)	309 (69.44)	428 (72.54)	
Education				
Primary or less	44 (30.56)	154 (35.08)	198 (33.96)	
Completed Primary	32 (22.22)	88 (20.05)	120 (20.58)	1.03, (*2*), *p= 0.60*
Secondary or higher	68 (47.22)	197 (44.87)	265 (45.45)	
Religion				
Christian-Catholic	52 (35.86)	171 (38.43)	223 (37.80)	
Christian-other	52 (25.86)	156 (35.06)	208 (35.25)	1.21, (*3*), *p = 0.75*
Muslim	31 (21.38)	97 (21.80)	128 (21.69)	
African traditional/Other	10 (6.90)	21 (4.72)	31 (5.25)	
Lived on streets				
Yes	39 (26.90)	137 (30.79)	176 (29.83)	0.79, (*1*), *p = 0.37*
No	106 (73.10)	308 (69.21)	414 (70.17)	
Parental living status				
Both parents alive	47 (32.41)	160 (35.96)	207 (35.08)	
One parent dead	65 (44.83)	172 (38.65)	237 (40.17)	1.74, (*2*), *p = 0.42*
Both parents dead	33 (22.76)	113 (25.39)	146 (24.75)	
Slum Location				
Bwaise	32 (22.07)	39 (8.76)	71 (12.03)	**27.93, (5), *p<.0001***
Kamwokya (1 missing)	43 (29.66)	144 (32.36)	187 (31.69)	
Makindye	6 (4.14)	38 (8.54)	44 (7.46)	
Nakulabye	20 (13.79)	37 (8.31)	57 (9.66)	
Nateete	31 (21.83)	111 (24.94)	142 (24.07)	
Mukono (2 missing)	13 (8.97)	76 (17.08)	89 (8.97)	
Sexual Behavior				
Condom Use First Sex				
Yes	94 (64.83)	167 (37.53)	261 (44.24)	**33.04, (*1*), *p <.0001***
No	51 (35.17)	278 (62.47)	329 (55.76)	

Alcohol before sex				
Yes	27 (18.62)	158 (35.51)	185 (31.36)	**14.49, (*1*), *p = 0001***
No	118 (81.38)	287 (64.49)	405 (68.64)	
Age at sexual debut				
<15	55 (37.93)	191 (42.92)	246 (41.69)	1.12, (*1*), *p = .29*
≥15	90 (62.07)	254 (57.08)	344 (58.31)	
Lifetime Sexual Partners (1 missing)				
<3	77 (53.10)	237 (53.38)	314 (53.31)	.003, (*1*), *p = .95*
≥3	68 (46.90)	207 (46.62)	275 (46.69)	
Traded Sex (7 missing)				
Yes	58 (40.00)	171 (38.43)	229 (38.81)	.1139, (*1*), *p = .74*
No	87 (60.00)	274 (61.57)	361 (61.19)	
HIV-positive				
Yes	12 (8.45)	69 (15.65)	81 (13.89)	**4.65, (*1*), *p = .03***
No	130 (91.55)	372 (84.35)	502 (86.11)	
Knowledge, Attitudes, Norms				
Condoms Prevent HIV				
Yes	134 (92.41)	398 (89.44)	532 (90.17)	1.09, (1), *p =.30*
No	11 (7.59)	47 (10.56)	58 (9.83)	
Condom Education				
Yes	121 (83.45)	343 (77.08)	464 (78.64)	2.64, (1), *p = .10*
No	24 (16.55)	1102 (22.92)	126 (21.36)	
Condom Use Self-Efficacy				
Yes	126 (86.90)	328 (73.71)	454 (76.95)	**10.72, (1) *p =.001***
No	19 (13.10)	117 (26.29)	136 (23.05)	
Plan to use Condoms				
Yes	132 (91.03)	299 (67.19)	431 (73.05)	**31.58, (1), *p <.0001***
No	13 (8.97)	146 (32.81)	159 (26.95)	
Condoms Not Pleasurable (1 missing)				
Yes	60 (41.67)	221 (49.66)	281 (47.71)	2.79, (1), *p =0.09*
No	84 (58.33)	224 (50.34)	308 (52.29)	
Parents Promote Condoms				
Yes	72 (49.66)	184 (41.35)	256 (43.39)	3.07, (1), *p = 0.08*
No	73 (50.34)	261 (58.65)	334 (56.61)	

*Fisher's Exact Test

Table 3. Bivariate and Multivariable Associations between Socio-demographic, Sexual Behaviors, Knowledge, Attitudes, Norms and Consistent Condom Use among Sexually Active Youth Living in the Slums of Kampala (n=590).

	Consistent Condom Use	
Variables	**Unadjusted OR (95% CI)**	**Adjusted AOR (95% CI)**
Socio-demographic		
Sex		
Female	1.21 (0.83-1.78)	1.47 (0.94-2.33)
Male	Ref	Ref
Age		
12-14	Ref	Ref
15-16	3.25 (0.89-20.97)	2.12 (0.49-15.10)
17-18	**5.58 (1.65-34.88)**	3.38 ((0.83-23.75)
Education		
Primary or less	Ref	Ref
Completed Primary	1.27 (0.75-2.15)	1.32 (0.72-2.41)
Secondary or higher	1.21 (0.79-1.87)	0.53 (0.55-1.43)
Religion[a]		
Christian-Catholic	Ref	
Christian-other	1.10 (0.70-1.71)	
Muslim	1.05 (0.63-1.74)	
African traditional/Other	1.57 (0.70-3.47)	
Lived on Streets		
Yes	0.83 (0.54-1.25)	
No	Ref	
Parental living status		
Both parents alive	Ref	
One parent dead	1.29 (0.84-1.99)	
Both parents dead	0.99 (0.60-1.65)	
Location[a]		
Bwaise	**4.80 (2.31-10.50)**	**4.48 (1.94-10.80)**
Kamwokya	1.75 (0.91-3.56)	1.83 (0.91-3.87)
Makindye	0.92 (0.30-2.53)	1.67 (0.51-5.07)
Nakulabye	**3.16 (1.43-7.19)**	**2.47 ((1.03-6.07)**
Nateete	1.63 (0.82-3.42)	1.54 (0.72-3.42)
Mukono	Ref	Ref
Sexual Behaviors		
Condom Use First Sex		
Yes	**3.07 (2.09-4.56)**	**2.07 (1.34-3.21)**
No	Ref	Ref
Alcohol before sex		
Yes	Ref	Ref

No	**2.41 (1.54-3.89)**	**2.25 (1.35-3.85)**
Age at sexual debut		
<15	Ref	
>=15	1.23 (0.84-1.81)	
Lifetime Sexual Partners		
<3	Ref	
>=3	1.01 (0.69-1.47)	
Traded Sex		
Yes	1.07 (0.73-1.56)	
No	Ref	
HIV-positive		
Yes	Ref	Ref
No	**2.01 (1.09-4.01)**	1.50 (0.76-3.16)
Knowledge, Attitudes, Norms		
Condoms Prevent HIV		
Yes	1.44 (0.75-2.99)	
No	Ref	
Condom Education		
Yes	1.50 (0.93-2.49)	
No	Ref	
Condom Use Self-Efficacy		
Yes	**2.37 (1.43-4.11)**	**2.54 (1.39-4.89)**
No	Ref	Ref
Plan to use Condoms		
Yes	**4.96 (2.81-9.47)**	**3.69 (1.97-7.48)**
No	Ref	Ref
Condoms Ruin Pleasure		
Yes	0.72 (0.49-1.06)	
No	Ref	
Parents Promote Condoms		
Yes	1.40 (0.96-2.04)	
No	Ref	

[a]Adjusted Odds Ratios were also calculated for all possible reference levels of location and resulted in the following significant associations:
Bwaise vs. Kamwokya (AOR: 2.45, 95% CI: 1.23-4.89)
Bwaise vs. Nateete (AOR: 2.92, 95% CI: 1.44-5.97)

2.2 Results

Among the total sample of youth who were sexually active (*N*=590), 24.6% (n = 145) reported consistent condom use in the last three months (Table 2). Of those reporting consistent condom use, 62.1% were female and 37.9% were male and 82.1% were ages 17-18.

There were no statistically significant differences in the proportions (column percent) between self-reported consistent and inconsistent condom use for the following demographic characteristics: gender, age, education, religion, and parental living status. However, there were also significant differences in the proportions between self-reported consistent and inconsistent condom use among the slum locations of the youth centers ($x^2 = 27.93$, df $= 5$, $p < .0001$). A higher percentage of youth reporting consistent condom use were located at Bwaise (22.2%) compared to inconsistent condom use (8.8%) and Nakulabye (13.8% vs. 8.3%, respectively).

Of the sexual risk behaviors presented in Table 2, there were statistically significant differences in proportions between self-reported consistent and inconsistent condom use related to condom use at first sex ($x^2 = 33.04$, df $= 1$, $p <.0001$), alcohol use before sex by participant or partners ($x^2 = 14.49$, df $= 1$, $p = .0001$) and reporting HIV+ status ($x^2 = 4.65$, df $= 1$, $p = 0.03$). There were no statistically significant differences in proportions between self-reported consistent and inconsistent condom use for age at sexual debut, number of lifetime sexual partners and traded/transactional sex.

A higher proportion of consistent condom use compared to inconsistent condom use reported using a condom at first sex (64.8% vs. 37.5%, respectively). In contrast, a lower proportion of consistent condom use compared to inconsistent condom use was noted for alcohol use before sex (18.6% vs 35.5%, respectively) and also for being HIV-positive (8.45% vs 15.7%, respectively).

Table 2 also presents condom knowledge, attitudes and norms for consistent condom use and inconsistent condom use among this sample of youth. There were statistically significant differences in proportions between self-reported consistent and inconsistent condom use for condom use self-efficacy ($\chi^2 = 10.72$, df $= 1, p = 0.001$) and planning to use a condom ($\chi^2 = 31.58$, df $= 1, p < .0001$). There were no statistically significant differences in proportions between self-reported consistent and inconsistent condom use for reporting that condoms prevent HIV, learned how to use a condom, condoms are unpleasurable and parents promote using condoms. A higher proportion of those reporting consistent condom use compared to inconsistent condom use reported condom use self-efficacy (86.9% vs. 73.7%, respectively) and planning to use condoms ((91.0% vs.67.2%, respectively).

Table 3 presents the results of the bivariate and multivariable logistic regression analyses. In the bivariate analyses, the following were associated with consistent condom use in the past three months: age 17-18 years (OR: 5.58, 95% CI: 1.65, 34.9), slum locations: Bwaise (OR: 4.80, 95% CI: 2.31, 10.50) and Nakulabye (3.16, 95% CI: 1.43, 7.19**)** compared to Mukono, condom use at first sex (OR: 3.07, 95% CI: 2.09, 4.56), no alcohol use by youth or partners before sex (OR: 2.41, 95% CI: 1.54, 3.89), self-reported HIV-negative status (OR: 2.01, 95% CI: 1.09, 4.01), condom use self-efficacy (OR: 2.37, 95% CI: 1.43, 4.11) and plan to use condoms (OR: 4.96, 95% CI: 2.81, 9.47)

In the multivariable analysis, the following were associated with consistent condom use: slum location: Bwaise vs. Mukono (AOR: 4.48, 95% CI: 1.94, 10.80) Bwaise vs. Kamwokya (AOR: 2.45, 95% CI: 1.23-4.89), Bwaise vs. Nateete (AOR: 2.92, 95% CI: 1.44-5.97) and Nakulabye vs. Mukono (AOR: 2.47, 95% CI: 1.03-6.07). The odds of youth in Bwaise and Nakulabye locations to report consistent condom use were 4.48 and 2.47 times, respectively, those in the slum location of Mukono. In addition, the odds of youth in Bwaise to report consistent condom use were 2.45 times those of youth in Kamwokya and 2.92 times those of youth in Nateete. In addition, condom use at first sex (AOR: 2.07, 95% CI: 1.34, 3.21), no alcohol use by youth or partners before sex (AOR: 2.25, 95% CI: 1.35, 3.85), condom use self-efficacy (AOR: 2.54, 95% CI: 1.39-4.89) and plan to use condoms (AOR: 3.69, 95% CI: 1.97, 7.48) were also associated with consistent condom use. Youth who reported using condoms at first sex and those who did not drink alcohol before sex were twice as likely to report consistent condom use. Having a plan to use condoms, followed by condom use self-efficacy had the strongest associations with consistent condom use. Gender was not found to be a statistically significant moderator of the relationship between any of the predictor variables and consistent condom use.

2.3 Discussion

The purpose of this study was to examine the prevalence of consistent condom use and the factors associated with consistent condom use to inform and improve the HIV prevention programs offered to youth in the slums of Uganda. The prevalence of consistent condom use among this sample of youth was only 24.6%. Given the critical nature of consistent condom use for HIV prevention (Crosby et al., 2003), the focus should be to improve the condom use and health promotion among these youth in the slums.

We found that condom use at sexual debut increased the likelihood of consistent condom use in the past three months. Those youth reporting condom use at first sex had over twice the odds of reporting consistent condom use than the youth who did not use a condom at sexual debut and nearly two thirds of consistent condom users reported using a condom at first sex.

Such findings suggest that condom use during sexual debut is a critically important indicator for future consistent condom use (SHAFII et al., 2004)As such, HIV prevention programs should promote and facilitate condom use among youth during their sexual debut to establish a pattern of condom use for future sexual activity. This result is consistent with the findings of the large, longitudinal study of Uganda youth (Valadez et al., 2014), which found condom use at first sex to have a marked impact on consistent condom use.

This study also found that the youth who did not drink alcohol before sex had more than double the odds of reporting consistent condom use. Over 80% of consistent condom users stated that they and their partners did not drink alcohol before sex. Research has shown that alcohol use is associated with unprotected sex, high-risk sexual behavior and increased risk of HIV transmission (Baliunas et al., 2010; Coldiron et al., 2008; Dietrich et al., 2013; Fisher, 2010; Kalichman et al., 2007; Pilgrim et al., 2015; Siziya et al., 2008; Ssekamatte et al., 2020; Weiser et al., 2006). A recent study of young adults in Kampala informal settlements found that drinking alcohol in the past 30 days was a predictor of engaging in multiple sexual partnerships (Ssekamatte et al., 2020). Moreover, research among this population of youth has demonstrated that alcohol use was associated with HIV, condomless sex and sexual risk behaviors were higher among the HIV-positive youth. (Kumar et al., 2020; Swahn et al., 2019). These findings highlight the need io incorporate effective strategies to reduce alcohol use of these youth in HIV prevention programs offered to these service-seeking youth.

The findings of the current study also show that condom use self-efficacy and having a plan to use condoms were highly associated with consistent condom use. These findings are consistent with prior research showing higher condom use self-efficacy and condom use intentions are key direct predictors of frequent condom use (Ajayi et al., 2019; Ajayi &

Olamijuwon, 2019; Espada et al., 2016; Heeren et al., 2007; Mehra et al., 2014). The results did not show that consistent condom use was associated with negative attitudes towards condoms or parental norms as demonstrated in prior studies (Bankole, Ahmed, et al., 2007; Bankole, Biddlecom, et al., 2007; Espada et al., 2016; Heeren et al., 2007). Given the low prevalence of consistent condom use in the current study, these results highlight the need to address and strengthen condom use self-efficacy and intentions among these youth as part of HIV prevention programs. Interventions should include activities to build applied skills in the correct use of condoms and strengthening intentions to use condoms at first sex and subsequent sexual activity.

This study also found that consistent condom use varies among the locations across the slum of Kampala. The findings show important disparities in consistent condom use and underscore the importance of examining peer groups and norms related to condom use. The prevalence of consistent condom use among participants in Bwaise, Kamwokya and Nateete were nearly five times the prevalence of consistent condom use in Makindye and three times that of Mukono. Such variability presents implications for consistency and tailoring of programs and program delivery across the centers, social worker training and implementation at UYDEL. Previous studies have focused on measures of disadvantage in slums and increased odds of sexual risk taking (Greif, 2012; Greif et al., 2011; Kamndaya et al., 2015; Kamndaya et al., 2014; Kamndaya et al., 2016; Thomas et al., 2011); however, little is known about the characteristics across the Kampala slums which may be drivers of the variation in sexual behaviors. Future and additional research is necessary regarding center and program characteristics to more specifically pin-point the key drivers of the noted disparities. In addition, understanding the local context, built environment and structural drivers that may vary across the slums may also help to understand these disparities.

The strengths of this study include examining the individual-level and contextual factors associated with consistent condom use among these under-studied youth to understand the modifiable factors which can inform more effective interventions and programs to reduce HIV risk and incidence. Despite strengths of this study, it was subject to several important limitations. First, the study utilized a cross-sectional convenience sample. However, this population is difficult to reach and is understudied; therefore, the collection of this data provides an invaluable insight to this population. Because of the cross-sectional design, this study did not assess temporality and cannot infer causality. Sensitive topics were used in the questionnaire, and misclassification may be present and have likely produced an underestimate of the overall and true prevalence of risky behaviors in the population. Self-reporting over the past time periods is subject to recall bias. Also, the measures did not include questions about access to condoms which may affect the consistency of their use.

Given the findings, it is imperative to develop programs to foster condom use at first sex in early adolescence and to focus on condom use self-efficacy and planning to promote consistent condom use and reduce HIV risk. In addition, this study affirms the need to reduce alcohol use to promote protective sexual behavior. Given the high prevalence of engaging in multiple sexual partnerships among this sample of youth, promotion of consistent condom use and protected sex is imperative for HIV prevention. This study also sheds new light on the significant differences in consistent condom use these service-seeking youth among drop-in centers where condom distribution and access are readily available. Future research is needed to explore the effectiveness of the HIV and alcohol use prevention programs offered to these youth, in addition to examining the characteristics of the surrounding slum neighborhoods and the youth center programs as drivers of sexual risk behaviors.

References

Ajayi, A. I., Ismail, K. O., & Akpan, W. (2019, Sep). Factors associated with consistent condom use: a cross-sectional survey of two Nigerian universities. *BMC public health, 19*(1), 1207. https://doi.org/10.1186/s12889-019-7543-1

Ajayi, A. I., & Olamijuwon, E. O. (2019). What predicts self-efficacy? Understanding the role of sociodemographic, behavioural and parental factors on condom use self-efficacy among university students in Nigeria. *PLoS One, 14*(8), e0221804. https://doi.org/10.1371/journal.pone.0221804

Baliunas, D., Rehm, J., Irving, H., & Shuper, P. (2010). Alcohol consumption and risk of incident human immunodeficiency virus infection: a meta-analysis. *International journal of public health, 55*(3), 159-166.

Bankole, A., Ahmed, F. H., Neema, S., Ouedraogo, C., & Konyani, S. (2007, Dec). Knowledge of correct condom use and consistency of use among adolescents in four countries in sub-Saharan Africa. *Afr J Reprod Health, 11*(3), 197-220. https://www.ncbi.nlm.nih.gov/pubmed/18458741

Bankole, A., Biddlecom, A., Guiella, G., Singh, S., & Zulu, E. (2007, Dec). Sexual behavior, knowledge and information sources of very young adolescents in four sub-Saharan African countries. *Afr J Reprod Health, 11*(3), 28-43. https://www.ncbi.nlm.nih.gov/pubmed/18458739

Bronfenbrenner, U. (1979). *The ecology of human development*. Harvard university press.

Cecil, H., Pinkerton, S. D., Bogart, L. M., Pavlovic, J., & Kimball, A. M. (2005, Nov). An empirical study of ordinal condom use measures. *J Sex Res, 42*(4), 353-358. https://doi.org/10.1080/00224490509552291

Cederbaum, J. A., Gilreath, T. D., & Barman-Adhikari, A. (2014, Dec). Perceived risk and condom use among adolescents in sub-Saharan Africa: a latent class analysis. *Afr J Reprod Health, 18*(4), 26-33. https://www.ncbi.nlm.nih.gov/pubmed/25854090

Coldiron, M. E., Stephenson, R., Chomba, E., Vwalika, C., Karita, E., Kayitenkore, K., Tichacek, A., Isanhart, L., Allen, S., & Haworth, A. (2008, Jul). The relationship between alcohol consumption and unprotected sex among known HIV-discordant couples in Rwanda and Zambia. *AIDS Behav, 12*(4), 594-603. https://doi.org/10.1007/s10461-007-9304-x

Crosby, R. A., DiClemente, R. J., Wingood, G. M., Lang, D., & Harrington, K. F. (2003, Jun). Value of consistent condom use: a study of sexually transmitted disease prevention among African American adolescent females. *Am J Public Health, 93*(6), 901-902. https://doi.org/10.2105/ajph.93.6.901

Culbreth, R., Swahn, M. H., Ndetei, D., Ametewee, L., & Kasirye, R. (2018). Suicidal ideation among youth living in the slums of Kampala, Uganda. *International Journal of Environmental Research and Public Health, 15*(2), 298.

Culbreth, R., Swahn, M. H., Salazar, L. F., Ametewee, L. A., & Kasirye, R. (2020). Risk factors associated with HIV, sexually transmitted infections (STI), and HIV/STI co-infection among youth living in the slums of Kampala, Uganda. *AIDS and Behavior, 24*(4), 1023-1031.

Dietrich, J., Sikkema, K., Otwombe, K. N., Sanchez, A., Nkala, B., de Bruyn, G., Van Der Watt, M., & Gray, G. E. (2013, Jul 1). Multiple levels of influence in predicting sexual activity and condom use among adolescents in Soweto, Johannesburg, South Africa. *J HIV AIDS Soc Serv, 12*(3-4), 404-423. https://doi.org/10.1080/15381501.2013.819312

Espada, J. P., Morales, A., Guillén-Riquelme, A., Ballester, R., & Orgilés, M. (2016, 2016/01/14). Predicting condom use in adolescents: a test of three socio-cognitive models using a structural equation modeling approach. *BMC public health, 16*(1), 35. https://doi.org/10.1186/s12889-016-2702-0

Fatusi, A., & Wang, W. (2009, Apr). Multiple sexual partnership mediates the association between early sexual debut and sexually transmitted infection among adolescent and young adult males in Nigeria. *Eur J Contracept Reprod Health Care, 14*(2), 134-143. https://doi.org/10.1080/13625180802601110

Fisher, J. C. (2010, 2010/06/01). Can we engage the alcohol industry to help combat sexually transmitted disease? *International journal of public health, 55*(3), 147-148. https://doi.org/10.1007/s00038-010-0142-7

Greif, M. J. (2012, Mar). Housing, medical, and food deprivation in poor urban contexts: implications for multiple sexual partnerships and transactional sex in Nairobi's slums. *Health Place, 18*(2), 400-407. https://doi.org/10.1016/j.healthplace.2011.12.008

Greif, M. J., Dodoo, F. N., & Jayaraman, A. (2011). Urbanisation, poverty and sexual behaviour: the tale of five African cities. *Urban Stud, 48*(5), 947-957. https://doi.org/10.1177/0042098010368575

Heeren, G. A., Jemmott III, J. B., Mandeya, A., & Tyler, J. C. (2007). Theory–based predictors of condom use among university students in the United States and South Africa. *AIDS Education & Prevention, 19*(1), 1-12.

Jama Shai, N., Jewkes, R., Levin, J., Dunkle, K., & Nduna, M. (2010, Nov). Factors associated with consistent condom use among rural young women in South Africa. *AIDS care, 22*(11), 1379-1385. https://doi.org/10.1080/09540121003758465

Kalichman, S. C., Simbayi, L. C., Kaufman, M., Cain, D., & Jooste, S. (2007). Alcohol use and sexual risks for HIV/AIDS in sub-Saharan Africa: systematic review of empirical findings. *Prevention science, 8*(2), 141.

Kamndaya, M., Kazembe, L. N., Vearey, J., Kabiru, C. W., & Thomas, L. (2015, May). Material deprivation and unemployment affect coercive sex among young people in the urban slums of Blantyre, Malawi: A multi-level approach. *Health Place, 33*, 90-100. https://doi.org/10.1016/j.healthplace.2015.03.001

Kamndaya, M., Thomas, L., Vearey, J., Sartorius, B., & Kazembe, L. (2014, Jun). Material deprivation affects high sexual risk behavior among young people in urban slums, South Africa. *J Urban Health, 91*(3), 581-591. https://doi.org/10.1007/s11524-013-9856-1

Kamndaya, M., Vearey, J., Thomas, L., Kabiru, C. W., & Kazembe, L. N. (2016, Mar). The role of material deprivation and consumerism in the decisions to engage in transactional sex among young people in the urban slums of Blantyre, Malawi. *Glob Public Health, 11*(3), 295-308. https://doi.org/10.1080/17441692.2015.1014393

Kumar, S., Culbreth, R. E., Swahn, M. H., & Kasirye, R. (2020). Examining correlates of alcohol related condom-less sex among youth living in the slums of Kampala, Uganda. *AIDS care, 32*(10), 1246-1250.

Lyons, M., Swahn, M. H., Whitaker, D., Brown, J. R., Kasper, J., & Culbreth, R. (2017). Associations of lifetime prevalence of homelessness with risky sex, sexual victimization, depressive symptoms, and suicidality among youth in Kampala, Uganda. *International Social Work*, 0020872819847753.

Mehra, D., Ostergren, P. O., Ekman, B., & Agardh, A. (2014). Inconsistent condom use among Ugandan university students from a gender perspective: a cross-sectional study. *Glob Health Action, 7*, 22942. https://doi.org/10.3402/gha.v7.22942

Ministry of Health. (2017). *Adolescent Health Risk Behaviors in Uganda: A National Cross Sectional Study 2017*. M. o. Health. http://library.health.go.ug/publications/adolescent-health/adolescent-health-risk-behaviors-uganda-national-cross-sectional

Muchiri, E., Odimegwu, C., Banda, P., Ntoimo, L., & Adedini, S. (2017, Jul). Ecological correlates of multiple sexual partnerships among adolescents and young adults in urban Cape Town: a cumulative risk factor approach. *Afr J AIDS Res, 16*(2), 119-128. https://doi.org/10.2989/16085906.2017.1318762

Perry, E. W., Culbreth, R., Swahn, M., Kasirye, R., & Self-Brown, S. (2020). Psychological distress among orphaned youth and youth reporting sexual exploitation in Kampala, Uganda. *Children and Youth Services Review, 119*, 105587.

Pilgrim, N. A., Ahmed, S., Gray, R. H., Sekasanvu, J., Lutalo, T., Nalugoda, F., Serwadda, D., & Wawer, M. J. (2015, Aug). Multiple sexual partnerships among female adolescents in rural Uganda: the effects of family structure and school attendance. *Int J Adolesc Med Health, 27*(3), 319-328. https://doi.org/10.1515/ijamh-2014-0032

Reynolds, H. W., Luseno, W. K., & Speizer, I. S. (2013). Consistent condom use among men with non-marital partners in four sub-Saharan African countries. *AIDS care, 25*(5), 592-600. https://doi.org/10.1080/09540121.2012.726340

Santelli, J. S., DiClemente, R. J., Miller, K. S., & Kirby, D. (1999, Feb). Sexually transmitted diseases, unintended pregnancy, and adolescent health promotion. *Adolesc Med, 10*(1), 87-108, vi. https://www.ncbi.nlm.nih.gov/pubmed/10086168

Scribner, R., Theall, K. P., Simonsen, N., & Robinson, W. (2010). HIV risk and the alcohol environment: advancing an ecological epidemiology for HIV/AIDS. *Alcohol Res Health, 33*(3), 179-183. https://www.ncbi.nlm.nih.gov/pubmed/23584059

Self-Brown, S., Culbreth, R., Wilson, R., Armistead, L., Kasirye, R., & Swahn, M. H. (2018). Individual and parental risk factors for sexual exploitation among high-risk youth in Uganda. *Journal of interpersonal violence*, 0886260518771685.

Shafii, T., Stovel, K., Davis, R., & Holmes, K. (2004). Is Condom Use Habit Forming?: Condom Use at Sexual Debut and Subsequent Condom Use. *Sexually transmitted diseases, 31*(6), 366-372. https://journals.lww.com/stdjournal/Fulltext/2004/06000/Is_Condom_Use_Habit_Forming___Condom_Use_at_Sexual.10.aspx

Siziya, S., Muula, A. S., Kazembe, L. N., & Rudatsikira, E. (2008, Feb 11). Harmful lifestyles' clustering among sexually active in-school adolescents in Zambia. *BMC Pediatr, 8*, 6. https://doi.org/10.1186/1471-2431-8-6

Ssekamatte, T., Tetui, M., Kibira, S. P. S., Isunju, J. B., Mugambe, R. K., Nabiwemba, E., Wafula, S. T., Buregyeya, E., & Bukenya, J. N. (2020). Multiple sexual partnerships and associated factors among young psychoactive-substance-users in informal settlements in Kampala, Uganda. *PLoS One, 15*(10), e0239323. https://doi.org/10.1371/journal.pone.0239323

Swahn, M. H., Culbreth, R., Salazar, L. F., Tumwesigye, N. M., Jernigan, D. H., Kasirye, R., & Obot, I. S. (2020). The Prevalence and Context of Alcohol Use, Problem Drinking and Alcohol-Related Harm among Youth Living in the Slums of Kampala, Uganda. *International Journal of Environmental Research and Public Health, 17*(7), 2451.

Swahn, M. H., Culbreth, R., Salazar, L. F., Tumwesigye, N. M., & Kasirye, R. (2019). Psychosocial correlates of self-reported HIV among youth in the slums of Kampala. *BMC public health, 19*(1), 1176.

Swahn, M. H., Gressard, L., Palmier, J. B., Kasirye, R., Lynch, C., & Yao, H. (2012). Serious violence victimization and perpetration among youth living in the slums of Kampala, Uganda. *Western journal of emergency medicine, 13*(3), 253.

Swahn, M. H., Palmier, J. B., Kasirye, R., & Yao, H. (2012). Correlates of suicide ideation and attempt among youth living in the slums of Kampala. *International Journal of Environmental Research and Public Health, 9*(2), 596-609.

Thomas, L., Vearey, J., & Mahlangu, P. (2011, May 7). Making a difference to health in slums: an HIV and African perspective. *Lancet, 377*(9777), 1571-1572. https://doi.org/10.1016/S0140-6736(11)60642-9

Toska, E., Pantelic, M., Meinck, F., Keck, K., Haghighat, R., & Cluver, L. (2017). Sex in the shadow of HIV: A systematic review of prevalence, risk factors, and interventions to reduce sexual risk-taking among HIV-positive adolescents and youth in sub-Saharan Africa. *PLoS One, 12*(6), e0178106. https://doi.org/10.1371/journal.pone.0178106

UAC. (2015). *National HIV and AIDS Strategic Plan 2015/2016-2019/2020*. Uganda AIDS Commission, Republic of Uganda. Retrieved January 18, 2021 from https://www.childrenandaids.org/index.php/Uganda_National-HIV-and-AIDS-Strategic-Plan_2015

Uganda Ministry of Health. (2012). *2011 Uganda AIDS Indicator Survey: Key Findings*. ICF International Retrieved May 7, 2020 from https://health.go.ug/docs/UAIS_2011_REPORT.pdf

Uganda Ministry of Health. (2019). *Uganda population-based HIV impact assessment (UPHIA) 2016–2017*. http://uac.go.ug/sites/default/files/UPHIA%20Final%20Report%20%5B2016%20-%202017%5D.pdf

UNAIDS. (2016). *Prevention Gap Report*. World Health Organization. https://www.unaids.org/sites/default/files/media_asset/2016-prevention-gap-report_en.pdf

UNAIDS. (2019). *AIDSinfo*. https://aidsinfo.unaids.org/

UNAIDS. (2020). *Global AIDS update 2020*. World Health Organization. Retrieved January 25, 2020 from https://www.unaids.org/sites/default/files/media_asset/2020_global-aids-report_en.pdf

United Nations. (2018). *World Urbanization Prospects: The 2018 Revision*. Department of Economic and Social Affairs Population Division. https://population.un.org/wup/Publications/Files/WUP2018-KeyFacts.pdf

Valadez, J. J., Jeffery, C., Davis, R., Ouma, J., Lwanga, S. K., & Moxon, S. (2014). Putting the C back into the ABCs: a multi-year, multi-region investigation of condom use by Ugandan youths 2003-2010. *PLoS One, 9*(4), e93083. https://doi.org/10.1371/journal.pone.0093083

Van Leeuwen, J. M., Sekeramayi, T., Martell, C., Feinberg, M., & Bowersox-Daly, S. (2017). A baseline analysis of the Katanga slums: informing urban public policy in Kampala, Uganda. *African Population Studies, 31*(2).

Warren, C. W., Santelli, J. S., Everett, S. A., Kann, L., Collins, J. L., Cassell, C., Morris, L., & Kolbe, L. J. (1998, Jul-Aug). Sexual behavior among U.S. high school students, 1990-1995. *Fam Plann Perspect, 30*(4), 170-172, 200. https://www.ncbi.nlm.nih.gov/pubmed/9711454

Weiser, S. D., Leiter, K., Heisler, M., McFarland, W., Percy-de Korte, F., DeMonner, S. M., Tlou, S., Phaladze, N., Iacopino, V., & Bangsberg, D. R. (2006). A population-based study on alcohol and high-risk sexual behaviors in Botswana. *PLoS Med*, *3*(10), e392.

Chapter 3

Paper 2. Across Six Slums in Uganda: Understanding Context and Location for Youth Involvement in Multiple Sexual Partnerships

3.0 Introduction

Sub-Saharan Africa bears the burden of the HIV epidemic with 25.6 million people living with HIV and nearly 60% of the new infections in 2019 and 64% of AIDS-related deaths (UNAIDS, 2020). Although HIV prevalence has decreased in Uganda, it still remains too high with high-risk and vulnerable groups (Yebra et al., 2015). Uganda is country with a very high population growth, facing high rates of urbanization with urban slums with limited resources and infrastructure (United Nations, 2018; Van Leeuwen et al., 2017). Uganda has a large youth population with half of the population under the age of 15 (Ministry of Health, 2017). Youth in the slums of Kampala face many challenges and health concerns such as homelessness and living on the streets (Lyons et al., 2017) lack of parents (Self-Brown et al., 2018; Swahn, Culbreth, Staton, & Kasirye, 2017), psychosocial distress (Perry et al., 2020), high prevalence of HIV and STIs (Culbreth et al., 2020; Swahn et al., 2019), suicidality (Culbreth et al., 2018; Swahn, Palmier, et al., 2012), violence (Swahn, Gressard, et al., 2012), alcohol use and problem drinking (Swahn et al., 2020) and disparities in sexual behaviors (Swahn et al., 2014). HIV prevalence among Ugandan children aged 0-14 is estimated at 0.5% and 6.2% among those 15-64 (Uganda Ministry of Health, 2019) with a notable higher prevalence estimated among vulnerable youth living in the slums, for both HIV and sexually transmitted infections (Culbreth et al., 2020; Swahn et al., 2019).

Evidence suggests that the decline in multiple sexual partner behavior was one of the factors impacting the decline in HIV infections during the successful campaign in the 1990s to early 2000s (Renzaho et al., 2017). There is a consensus among studies that having unprotected sex with multiple sexual partners is the greatest risk factor for HIV and other sexually transmitted infections (STIs) among youth (Pilgrim et al., 2015; Santelli et al., 1998; Wilson Chialepeh & Sathiyasusuman, 2015). A systematic review of 68 African epidemiological studies from 1987 to 2006 found a clear relationship between number of lifetime sex partners and HIV infection (95% CI: 2.52–3.71) (Chen et al., 2007).

Because many adolescents and young adults fail to use condoms correctly and consistently, the number of sexual partners they have is an important risk factor for sexually transmitted diseases, including HIV (Santelli et al., 1998). Identifying factors that are associated with having multiple partners can help in the design of disease interventions. In order to lower the risk of HIV by reducing the number of sexual partners, a better understanding of the factors which affect youth's risk behaviors is needed (Cowan & Pettifor, 2009). Incidence rate of HIV have been found to be highest among youth with the greatest number of partners in the last 12 months (Chen et al., 2007; Grabowski et al., 2017). Prevention of HIV in adolescents and young adults is critical to the control of the pandemic overall, as approximately 45% of the people who become HIV infected each year are aged 15-24 (Pilgrim et al., 2015).

Young women, ages 15-24, in Uganda and in sub-Saharan Africa are twice as likely than men to be living with HIV, and more than 80% of new infections among adolescents aged 15-19 years are among girls (UNAIDS, 2020), with most acquisitions occurring through heterosexual intercourse (Cowan & Pettifor, 2009; DiClemente & Crosby, 2009; Pilgrim et al., 2015). Contrary to other studies in sub-Saharan Africa showing that higher risk for HIV and prevalence rises with increasing age, Santelli et al. (2013) found that the risk of HIV acquisition increased with age only among the young men, but not the women. The lack of an impact of age among young women was noted as concerning as it suggests that HIV risk is high as soon as young women initiate sexual intercourse (Santelli et al., 2013). A 2003 study of South African youth reported similar findings in younger age groups, aged 15-24, increasing lifetime number of sexual partners was significantly associated with HIV infection among both men and women (Pettifor et al., 2005).

Several studies have examined factors associated multiple sexual partnerships among adolescents and young adults in sub-Saharan Africa. Such factors include socio-demographic factors: age, sex, residence, religion, and less education (Pilgrim et al., 2015; Renzaho et al., 2017; Santelli et al., 2013; Wilson Chialepeh & Sathiyasusuman, 2015; Zuma et al., 2010), urban vs rural residence and higher levels of poverty (Wilson Chialepeh & Sathiyasusuman, 2015); family structure and parental monitoring (Pilgrim et al., 2015; Toska et al., 2017); alcohol use (Pilgrim et al., 2015; Ssekamatte et al., 2020) and early sexual debut (Zuma et al., 2010).

Conceptual Framework

Adolescent sexuality is influenced at multiple levels. Bronfenbrenner's ecological systems theory (Bronfenbrenner, 1992) explains sexual risk in terms of the individual (microsystem), family, peers and romantic relationships (mesosystem), the larger social systems, such as the community, which dictate social norms and expectations (exosystem), and, last, the rules that govern society, such as legislation regarding adolescents (macrosystem), which provides a conceptual framework to examine HIV risk among adolescents in sub-Saharan Africa (Dietrich et al., 2013; Toska et al., 2017).

In sub-Saharan Africa, studies of risky sexual behaviours among youth have mainly been reported on individual and family factors, and limited literature is available on how community-level factors may influence risky sexual behaviours (Mimiaga et al., 2015; Muchiri et al., 2017; Onoya et al., 2015; Stephenson, 2009). Understanding whether distinct slum communities drive multiple sexual partnerships and other risky sexual behavior is missing in the literature and is critical in assessing the need for tailored programming for individual youth centers and to determine the need for future studies examining the attributes of each slum community and the structural drivers therein. This study also aims to examine the risk factors associated with engaging in multiple sexual partnerships among a vulnerable and under-studied adolescent population across the urban slums of Kampala. No study to our knowledge has examined the individual and community drivers of multiple sexual partnerships among this adolescent age group in the slums.

Study Aims and Research Questions

This study aimed to examine the individual and community-level factors for engaging in multiple sexual partnerships among sexually active youth in slums, ages 12-18 years. In particular, this study aims to identify whether slum location is a predictor for multiple sexual partnerships. The guiding research questions were as follows: (1) What is the prevalence of having lifetime multiple sexual partners (3 or more) among male and female youth attending six youth centers across the slums of Kampala?; (2) Do the demographic characteristics of youth with multiple sexual partners (three (3) or more lifetime partners) differ from those with only 1-2 lifetime sexual partners?; (3) Does having multiple sexual partners and other sexual behaviors differ by the location of distinct slum communities across Kampala?; and (4) Which individual and community-level factors are significantly associated with multiple sexual partnerships among male and female youth who live in the slums of Kampala?

3.1 Methods

The current study is based on the "Kampala Youth Survey 2014", a cross-sectional survey conducted in March and April 2014 to quantify and examine high-risk behaviors and exposures in a convenience sample of urban youth, 12-18 years of age, living in the slums or on the streets of Kampala, Uganda, who were participating in a Uganda Youth Development Link (UYDEL) drop-in center for disadvantaged street and slum youth.

Participants and Recruitment

Each social worker and peer educator received comprehensive training on the study methodology, interpretation of each survey question and its translation into Luganda (the local language), if needed. In addition, the social workers and peer educators received training on recruitment and consent methods in order to facilitate potential participants among attendants at their specific youth drop-in center. Study participants were recruited through convenience sampling of the youth at six drop-in centers and the neighborhoods surrounding the UYDEL drop-in centers primarily through word-of-mouth. Face-to-face interviews were conducted by social workers and peer educators employed by UYDEL with previous experience working with youth within the targeted drop-in centers and communities. Over the 15-day (March 19 to April 2) survey collection period, 1628 youth were approached for participating in the survey. Among these youth, 131 declined, yielding a participation rate of 92%. A total of 1,497 surveys were collected, including 43 pilot cases. Three hundred and twenty (320) surveys were lost due to technical issues with the survey software and server, yielding 1,134 completed surveys for the final analytic sample of youth between the ages of 12 and 18 (44% boys, 56% girls). Participants were informed about the study and read (or were read to) the consent forms to indicate their willingness to take the survey. All participants provided verbal consent to participate in the study. Participation was limited to youth ages 12-18 present in-person on of the day the field visit. There were no other exclusion criteria. Recruited youth received a small snack as incentive for participating in the survey. IRB approvals were obtained from the Georgia State University and the Uganda National Council on Science and Technology to conduct this study in Kampala. The Kampala Youth Survey 2014 was administered to the participants on Google Nexus 7 tablets using survey software. The use of tablets as an "mHealth" technology allowed for easier administration of the survey and streamlined data collection. UYDEL interviewers received a one-day training on survey administration protocols and the use of the tablet. Interviewers were also assigned a tablet with a unique identifier to be used over the course of the survey administration. During training interviewers were instructed to read the survey questions exactly as they appeared on the tablet screen after obtaining consent from the participants. The tablets were programmed to notify the interviewers of any missed questions and also processed skip patterns automatically for more accurate data collection.

Survey Measures

The Kampala Youth Survey 2014 was based on previously validated quantitative measures to assess alcohol use, violence perpetration and victimization, prevalence of alcohol marketing, sexual behaviors and mental health among adolescents and have been previously described (Swahn et al., 2019). Participants were queried on demographics, alcohol usage, perception and beliefs related to alcohol and sex as well as their knowledge of HIV/AIDS and other sexually transmitted infections (STIs). Questions included in the survey were collected from previously validated instruments used in the United States and globally to measure alcohol and sexual related behavior as well as mental health, including; Global School-based Student Health Survey (GSHS), Kampala Youth Survey 2011, MAMPA 2012 Questionnaire, CAGE Questionnaire, iMPPACS, AIDS Indicator Survey and the Demographic Health Survey. The survey was available to participants in both English and Luganda (the local language). All survey translation was conducted by a certified Luganda translator and back-translated for accuracy.

For the purposes of this study, analyses included all male and female participants, 12-18 years of age, who reported ever having engaged in sexual activity in response to that survey question.

Measures:

Dependent variable. Lifetime multiple sexual partnerships was the outcome variable of interest. and was measured using the following survey question: With how many different people have you had sexual intercourse in your lifetime? (Table 1). Respondents could answer “None”, “1-2 partners”, “3-4 partners”, “5-6 partners, “6 or more partners”. Respondents were categorized into a dichotomous variable for those with multiple lifetime partnerships of three (3) or more partners in lifetime and those with 1-2 lifetime partners.

Individual-Socio-demographic. For the purposes of this study, Sex was coded as male and female. Age was treated as a categorical variable with three age categories, 12-14 years, 15-16 years and 17-18 years. Education was categorized as Primary or less and Secondary or higher. Ever lived on the streets was coded as yes or no.   Parental status was a three-category variable based on the response categories: both parents dead, one parent living, both parents living.

Individual-Risk Behaviors. Sexual risk behaviors have been shown to predict the number of sexual partnerships over a lifetime. Respondents were asked about their age of sexual initiation with the following question: How old were you when you had sexual intercourse for the first time? Responses were as follows: <12 years of age, 13-14 years of age, 15-16 years of age, 17-18 years of age. In addition, participants were queried regarding their use of alcohol before sex and alcohol use in the past year, with possible responses of “yes” and “no”.

Respondents were also asked about engaging in traded sex with the following question: “Have you ever gotten money, food, or other things for having sexual intercourse with someone?” Respondent could answer “Yes” or “No” to the question. Respondents were asked about their HIV status. “HIV-positive” was measured by the following question, “Have you been told by a doctor/nurse or HIV counselor that you have HIV, the virus that causes AIDS?” Respondent could answer “Yes” or “No” to the question.

Community. The survey prompted the interviewers to record the location of the Youth Center where the respondent was sampled, based on the following question: “This survey is taken at the following UYDEL location”. Responses included the following: Bwaise, Kamwokya, Makindye, Nakulabye, Nateete and Mukono.

Table 1. Wording of Survey Measures and Response Choices

Variable	Survey Question	Response Choices	Computed Variable
Gender	What is your sex?	Boy, Girl	"Gender" 0= Boy 1= Girl
Age	How old are you?	12 years, 13, 14, 15, 16, 17, 18	"Agecat" 0=12-14 1=15-16 2=17-18
Education	What level of education did you complete?	Never been to school, Primary, Secondary, Tertiary, Some Primary, Some Secondary	"Qschool" 0-Primary or less 1-Completed Primary 2-Secondary or more
Religion	What is your religion?	Christian-Catholic Christian-Other Muslim African Traditional Other	"Religion" 0- Christian-Catholic 1- Christian-Other 2 - Muslim 3- African Traditional/Other
Ever lived on Streets	Have you ever lived on the streets with no other place to go?	Yes, No	"Livedstreets" 0- No 1- Yes
Parental Living Status	Are one or both of your parents alive?	Both alive Both dead, One alive	"Parentsdead" 0- Both alive 1- Both dead, 2- One alive
Slum Location	UYDEL Youth Center location	Bwaise Kamwokya Makindye Nakulabye Nateete Mukono	"Location" 0- Bwaise 1- Kamwokya 2- Makindye 3- Nakulabye 4- Nateete 5- Mukono

Alcohol Use	Have you had a drink of alcohol in the past year?	Yes, No	"qdrink" 0- No 1- Yes
Alcohol Before Sex	Do you drink alcohol before having sexual intercourse?	Yes, No	"selfalcsex" 0- No 1- Yes
Age at Sexual Debut	How old were you when you had sexual intercourse for the first time?	<12, 13-14, 15-16, 17-18	"agefirstsex1" 0- ≤12 1- 13-14 2- 15-16 3- 17-18
Lifetime Sexual Partners	With how many different partners have you had sexual intercourse in your lifetime	None, 1-2 partners, 3-4 partners, 5-6 partners, More than 6	"sexpartners3" 2 or fewer (≤ 2) 3 or more (≥ 3)
Traded Sex	Have you ever gotten money, food, or other things for having sexual intercourse with someone?	Yes, No	"transactsex" 0- No 1- Yes
HIV-positive	Have you been told by a doctor/nurse or HIV counselor that you have HIV?	Yes, No	"QHIV" 0-No 1-Yes
Consistent Condom Use	In the past three months, how often did you or your partner use a condom when having sexual intercourse?	Never, Sometimes, Most of the time, Always	"ccur" 1- Consistent = Always 2- Inconsistent = Never, Sometimes, Most of the time,
Condom Use First Sex	Did you use a condom the first time you had sexual intercourse?	Yes, No	"condomfirst" 0- No 1- Yes

Data Analysis

Data was coded and entered into SAS 9.4 for statistical analysis. Descriptive statistics (sample number and column percent, chi-square tests) were computed for all demographic and risk behavior characteristics between youth with three or more lifetime sexual partners and those with two or fewer lifetime sexual partners. Chi-square tests were performed to determine statistically significant differences ($p<0.05$) and Fisher Exact Tests were used when the expected cell sizes were less than five (Table 2). Descriptive statistics were also computed for the demographic and risk behaviors by youth center location (Table 3). Finally, a multivariable analysis was conducted to determine the statistically significant factors related to three or more reported lifetime multiple sexual partners. Bivariate and multivariable logistic regression analyses were computed to determine the association between lifetime multiple sexual partners and the individual and community- level independent variables. Odds ratios and 95% confidence intervals are reported from the bivariate and multivariable analyses. Those variables with a statistical significance of $p < 0.05$ were manually selected for the final multivariable model. Gender was investigated as a potential effect modifier through interaction terms of gender and each independent variable to explore the effect of gender on the relationship between the potential risk factors and multiple sexual partnerships. The interaction terms which were significant in the bivariate analyses were then separately tested for statistical significance in the multivariable model.

Table 2: Characteristics of Sexually Active Youth and Number of Lifetime Sexual Partners among Youth in the Slums of Kampala, 2014 (n=592)

Characteristics	Number of lifetime sexual partners reported		Total Sample	Chi-square statistic, (*df*), *p*
	≤ 2 Partners 316 (53.4)	3+ Partners 276 (46.6)	592 (100%)	
Sex				
Male	118 (37.3)	125 (45.3)	243 (41.1)	3.85, (1),
Female	198 (62.7)	151 (54.7)	349 (58.9)	*p=.05*
Age				
12-14	29 (9.2)	2 (0.72)	31 (5.2)	***p*<.0001[a]**
15-16	79 (25.0)	53 (19.2)	132 (22.3)	
17-18	208 (65.8)	221 (80.1)	429 (72.5)	
Education (7 missing)				
Primary or less	100 (31.9)	98 (36.0)	198 (33.9)	1.08, (2),
Completed Primary	66 (21.1)	54 (19.9)	120 (20.5)	*p*=.58
Secondary or more	147 (47.0)	120 (44.1)	267 (45.6)	
Religion				
Christian-Catholic	121 (38.3)	102 (37.0)	223 (37.7)	**11.13, (3),**
Christian-other	111 (35.1)	98 (35.5)	209 (35.3)	***p*=.01**
Muslim	76 (24.1)	53 (19.2)	129 (21.8)	
African Traditional/Other	8 (2.5)	23 (8.3)	31 (5.2)	
Ever lived on Streets				
Yes	58 (18.3)	117 (42.4)	175 (29.6)	**40.88, (1),**
No	258 (81.7)	159 (57.6)	417 (70.4)	***p*<.0001**
Parental Living Status				
Both Parents Alive	127 (40.2)	80 (29.0)	207 (35.0)	**9.56, (2),**
One parent Alive	123 (38.9)	116 (42.0)	239 (40.1)	***p*=.01**
Both Parents Dead	66 (20.9)	80 (29.0)	146 (24.7)	
Alcohol Use				
Yes	107 (33.9)	189 (68.5)	296 (50.0)	**70.62, (1)**
No	209 (66.1)	87 (31.5)	296 (50.0)	***p*<.0001**
Alcohol Use Before Sex				
Yes	35 (11.1)	115 (41.8)	150 (25.4)	**73.38, (1),**
No	281 (88.9)	160 (58.2)	441 (74.6)	***p*<.0001**
Age at Sexual Debut				
≤12	30 (9.5)	40 (14.5)	70 (11.8)	**26.87, (3),**
13-14	76 (24.1)	100 (36.2)	176 (29.7)	***p*<.0001**
15-16	138 (43.7)	110 (39.9)	248 (41.9)	
17-18	72 (22.8)	26 (9.4)	98 (16.6)	
Transactional Sex				
Yes	89 (28.2)	142 (51.4)	231 (39.0)	**33.57, (1),**
No	227 (71.8)	134 (48.6)	361 (61.0)	***p*<.0001**

HIV-positive				
Yes	40 (12.9)	41 (14.9)	81 (13.8)	0.51, (1)
No	271 (87.1)	234 (85.1)	505 (86.2)	*p*=.47
Youth Center Location				
Bwaise	48 (15.2)	23 (8.3)	71 (12.0)	8.74, (5)
Kamwokya	90 (28.5)	98 (35.5)	188 (31.8)	*p=.12*
Makindye	25 (7.9)	19 (6.9)	44 (7.4)	
Nakulabye	32 (10.1)	25 (9.1)	57 (9.6)	
Nateete	75 (23.7)	66 (23.9)	141 (23.8)	
Mukono	46 (14.6)	45 (16.3)	91 (15.4)	

Note: One observation deleted due to missing response for lifetime multiple sexual partners question
[a]Fisher's Exact Test performed where expected cell counts n<5

Table 3. Individual Demographic and Behavioral Characteristics of Sexually Active Youth Attending Uganda Youth Development Link (UYDEL) Drop-in Centers by Slum Location (n=593)

Factor	Bwaise 71 (12.0%)	Kamwokya 188 (31.7%)	Makindye 44 (7.4%)	Nakulabye 57 (9.6%)	Nateete 142 (24.0%)	Mukono 91 (15.3%)	Total 593 (100%)	*p*-value
Sex								
Male	42 (59.2)	59 (31.4)	10 (22.7)	28 (49.1)	78 (54.9)	27 (29.7)	244 (41.2)	***<.0001***
Female	29 (40.8)	129 (68.6)	34 (77.3)	29 (50.1)	64 (45.1)	64 (70.3)	349 (58.8)	
Age								
12-14	1 (1.4)	9 (4.8)	8 (18.2)	3 (5.3)	6 (4.2)	4 (4.4)	31 (5.2)	***.0052***[a]
15-16	10 (14.1)	47 (25.0)	12 (27.3)	13 (22.8)	23 (16.2)	27 (29.7)	132 (22.3)	
17-18	60 (84.5)	132 (70.2)	24 (54.5)	41 (71.9)	113 (79.6)	60 (65.9)	430 (72.5)	
Age, mean (SD)	17 (1.0)	17 (1.2)	16 (1.9)	17 (1.2)	17 (1.2)	17 (1.1)	17.0 (1.3)	
Education								
Primary or less	27 (38.0)	68 (36.2)	18 (42.9)	11 (20.0)	40 (28.2)	34 (38.6)	198 (33.8)	***0.025***
Completed Primary	6 (8.5)	34 (18.1)	11 (26.2)	17 (30.9)	33 (23.2)	19 (21.6)	120 (20.5)	
Secondary or more	38 (53.5)	86 (45.7)	13 (30.9)	27 (49.1)	69 (48.6)	35 (39.8)	268 (45.7)	
Religion								
Christian-Catholic	30 (42.3)	82 (43.6)	9 (20.5)	24 (42.1)	50 (35.2)	29 (31.9)	224 (37.8)	***<.0001***[a]
Christian-other	18 (25.4)	65 (34.6)	28 (63.6)	17 (29.8)	53 (37.3)	28 (30.8)	209 (35.2)	
Muslim	23 (32.4)	28 (14.9)	7 (15.9)	13 (22.8)	37 (26.1)	21 (23.1)	129 (21.8)	
African Traditional/Other	0 (0.00)	13 (6.9)	0 (0.00)	3 (5.3)	2 (1.4)	13 (14.3)	31 (5.2)	
Ever lived on Streets								
Yes	23 (32.4)	64 (34.0)	16 (36.4)	10 (17.5)	44 (31.0)	19 (20.9)	176 (29.7)	*0.06*
No	48 (67.6)	124 (66.0)	28 (63.6)	47 (82.5)	98 (69.0)	72 (79.1)	417 (70.3)	
Parental Living Status								
Both Alive	31 (43.7)	70 (37.2)	10 (22.7)	16 (28.1)	58 (40.9)	23 (25.3)	208 (35.1)	***.0003***
One Parent Alive	34 (47.9)	57 (30.3)	19 (43.2)	28 (49.1)	55 (38.7)	46 (50.5)	239 (40.3)	
Both Dead	6 (8.4)	61 (32.5)	15 (34.1)	13 (22.8)	29 (20.4)	22 (24.2)	146 (24.6)	
Age at Sexual Debut								
≤12	10 (14.1)	16 (8.5)	12 (27.3)	10 (17.5)	17 (12.0)	6 (6.6)	71 (12.0)	***<.0001***
13-14	16 (22.5)	49 (26.1)	19 (43.2)	19 (33.3)	34 (23.9)	39 (42.9)	176 (29.7)	

15-16	27 (38.0)	97 (51.6)	11 (25.0)	21 (36.8)	53 (37.3)	39 (42.9)	248 (41.8)	
17-18	18 (35.4)	26 913.8)	2 (4.6)	7 (12.3)	38 (26.8)	7 (7.7)	98 (16.5)	
Alcohol Use								
Yes	24 (33.8)	106 (56.4)	22 (50.0)	25 (43.9)	66 (46.5)	53 (58.2)	296 (49.9)	***.0125***
No	47 (66.2)	82 (43.6)	22 (50.0)	32 (56.1)	76 (53.5)	38 (41.8)	297 (50.1)	
Alcohol Use Before Sex								
Yes	8 (11.3)	57 (30.3)	21 (48.8)	12 (21.1)	28 (19.7)	24 (26.4)	150 (25.3)	***.0001***
No	63 (88.7)	131 (69.7)	22 (51.2)	45 (78.9)	114 (80.3)	67 (73.6)	442 (74.7)	
Transactional Sex								
Yes	10 (14.1)	87 (46.3)	24 (54.5)	21 (38.8)	47 (33.1)	42 (46.2)	231 (38.9)	***<.0001***
No	61 (85.9)	101 (53.7)	20 (45.5)	36 (63.2)	95 (66.9)	49 (53.9)	362 (61.1)	
HIV-positive								
Yes	1 (1.47)	27 (14.36)	13 (29.5)	3 (5.36)	22 (15.8)	15 (16.5)	81 (13.8)	***.0005***
No	67 (98.5)	161 (85.6)	31 (70.5)	53 (94.6)	117 (84.2)	76 (83.5)	505 (86.2)	
Condom at first sex								
Yes	44 (62.0)	63 (33.5)	13 (29.6)	33 (57.9)	73 (51.4)	36 (39.6)	262 (44.2)	***<.0001***
No	27 (38.0)	125 (66.5)	31 (70.5)	24 (42.1)	69 (48.6)	55 (60.4)	331 (55.8)	
Consistent condom use								
Yes	32 (45.1)	43 (23.0)	6 (13.6)	20 (35.1)	31 (21.8)	13 (14.6)	145 (24.6)	***<.0001***
No	39 (54.9)	144 (77.0)	38 (86.4)	37 (64.9)	111 (78.2)	76 (85.4)	445 (75.4)	
Multiple Sex Partners								
≤ 2	48 (67.6)	90 (47.9)	25 (56.8)	32 (56.1)	75 (53.2)	46 (50.6)	316 (53.4)	*0.12*
3+	23 (32.4)	98 (52.1)	19 (43.2)	25 (43.9)	66 (46.8)	45 (49.4)	276 (46.6)	

[a]Fisher's Exact Test performed where expected cell counts n<5

Table 4: Bivariate and Multivariable Logistic Regression of Factors Associated with Multiple Sexual Partners among Sexually Active Male and Female Youth, 12-18 Years of Age in the Kampala slums, 2014 (n=592)

Factors	**Multiple Sexual Partnerships (3+ partners)**	
	OR (95%CI)	**AOR (95%CI)**
Sex		
Male	1.39 (1.00-1.93)	
Female	Ref	
Age	**1.47 (1.27-1.70)**	**2.37 (1.88-2.99)**
Education		
Less than Primary	1.20 (0.83-1.74)	1.12 (0.68-1.84)
Completed Primary	1.00 (0.65-1.54)	1.05 (0.59-1.85)
Secondary or more	Ref	Ref
Religion		
Christian-Catholic	Ref	Ref
Christian-Protestant	1.05 (0.72-1.53)	1.02 (0.63-1.67)
Muslim	0.83 (0.53-1.28)	0.93 (0.52-1.66)
African Traditional/Other	**3.41 (1.52-8.43)**	**5.83 (2.14-15.89)**
Ever lived on Streets		
Yes	**3.27 (2.27-4.77)**	
No	Ref	
Parental Living Status		
Both Parents Alive	Ref	Ref
One parent Alive	**1.50 (1.03-2.19)**	1.49 (0.91-2.41)
Both Parents Dead	**1.92 (1.26-2.97)**	**1.83 (1.03-3.26)**
Age at Sexual Debut		
≤12	**3.69 (1.94-7.17)**	**13.13 (4.86-35.44)**
13-14	**3.64 (2.15-6.33)**	**6.64 (3.24-13.60)**
15-16	**2.21 (1.33-3.74)**	**2.36 (1.28-4.37)**
17-18	Ref	Ref
Alcohol Use Past Year		
Yes	**4.24 (3.02-6.01)**	**2.01 (1.25-3.24)**
No	Ref	Ref
Alcohol Use Before Sex		
Yes	**5.77 (3.81-8.93)**	**2.93 (1.65-5.20)**
No	Ref	Ref
Transactional Sex		
Yes	**2.70 (1.93-3.81)**	**2.40 (1.47-3.92)**
No	Ref	Ref
HIV-positive		
Yes	1.19 (0.74-1.90)	-
No	Ref	-
Youth Center Location		
Bwaise	Ref	Ref
Kamwokya	**2.27 (1.29-4.09)**	**2.22 (1.04-4.73)**
Makindye	1.59 (0.73-3.46)	0.86 (0.28-2.64)

Nakulabye	1.63 (0.79-3.38)	1.53 (0.61-3.84)
Nateete	**1.84 (1.02-3.38)**	2.06 (0.98-4.32)
Mukono	**2.04 (1.08-3.93)**	1.48 (0.62-3.54)
Interaction terms		
Gender*Ever Lived on Streets	***p*=0.0004[b]**	***p*= .047[b]**
Ever Lived on Streets=yes		
Male	1.57 (0.92-2.67)	1.25 (0.65-2.38)
Female	6.21 (3.59-10.74)	**3.23 (1.61-6.45)**
Gender*Traded Sex[a]		
Traded Sex=yes	***p*=.03[b]**	
Male	2.05 (1.01-4.13)	
Female	5.24 (3.27-8.40)	

[a]Note: Not significant when run in multivariable model as the only interaction term
[b] Wald Chi-square tests

3.2 Results

Among the total sample of youth (n=592), 46.6% (n=276) reported having three or more lifetime sexual partners. Of those reporting three or more lifetime partners, 54.7% were female and 45.3% were male, and 20% were only 12-16 years of age.

Between those youth reporting three or more lifetime sexual partners and those reporting only one to two partners, there were significant differences in proportions (column percents) for gender (x^2=3.85, df = 1, p=.05), (age ($p < .0001$), religion (x^2=11.13, df = 3, p=.01), ever living on the streets (x^2=40.88, df = 1, $p < .0001$) and parental living status ($x^2=9.56$, $df = 2$, p =.01). Of the youth with three or more partners, 42% reported ever living on the streets compared to only 18% of youth with two or fewer lifetime partners . A lower percentage of youth who have both parents alive (29%) reported having multiple lifetime sexual partners compared to 40.2% reporting only one to two lifetime sexual partners. There were no statistically significant differences in proportions between the two groups for education level and location of the youth centers.

Of the risk behaviors also presented in Table 2, there were statistically significant differences in proportions between those reporting three or more lifetime sexual partners and those reporting only one to two partners for alcohol use in the past year (x^2=70.62, df = 1, p < .0001), alcohol use before sex (x^2=73.38, df = 1, p < .0001), age at sexual debut (x^2=26.87, df = 3, p < .0001), and transactional sex (x^2=33.57, df = 1, p < .0001). The proportion of youth with multiple sexual partners (3+) who reported alcohol use was nearly double the proportion of those with two or few lifetime sexual partners (68.5% vs 33.9%). Similarly, compared to the youth with two or fewer partners, the proportion of those youth with three or more partners who reported the consumption of alcohol before sex was nearly four times as high (41.8% vs. 11.1%) and those who engaged in transactional sex were almost twice as likely to report three or more lifetime sexual partners, compared to the youth with two or fewer partners (51.4% vs. 28.2%).

Individual demographic and risk behaviors were reported in Table 3 to examine differences in characteristics of the youth among the six youth centers. Statistically significant differences in youth characteristics were found in gender, age, education, religion, parental living status, age at sexual debut, alcohol use, alcohol use before sex, transactional sex, HIV-positive status, condom use at first sex and consistent condom use. We did not find a statistically significant difference in the number of lifetime multiple sex partners reported by the youth among the six centers. Notable differences among the six centers were the percentage of youth reporting age of sexual debut at 12 years or younger, Makindye youth were four times as likely as Mukono to report such early sexual initiation. In addition, Makindye youth were twice as likely as Bwaise to report sexual debut at 13-14 years of age. Alcohol use was highest for youth at Mukono (58.2%) and lowest for Bwaise (33.8%). Alcohol use before sex was more than four times higher for youth in Makindye than for youth in Bwaise. Reporting transactional sex was also highest for youth attending Makindye

(54.4%), with Kamwokya and Mukono almost 50%. The percentage of youth reporting HIV-positive status was also highest for Makindye with almost 30% and was far higher than Bwaise (1.5%) and Nakulabye (5.4%). Condom use at first sex and consistent condom use were highest among youth in Bwaise and lowest among youth in Makindye, with nearly double the youth in Bwaise reporting condom use at first sex (62.0% vs. 29.6) and three times the youth reporting consistent condom use (45.1% vs. 13.6%)

The results of the bivariate and multivariable logistic regression analyses are presented in Table 4. In the bivariate analyses, the following were statistically significant: age (OR 1.47, 95% CI: 1.27, 1.70), African Traditional/Other religion (OR 3.41, 95% CI: 1.52, 8.43), ever lived on the streets (OR 3.27, 95% CI: 2.27, 4.77), both parents dead (OR 1.92, 95% CI: 1.26, 2.97), one parent alive (OR 1.50, 95% CI: 1.03, 2.19), age at sexual debut: 12 year or younger (OR 3.69, 95% CI: 1.94, 7.17), 13-14 years of age (OR 3.64, 95% CI: 2.15, 6.33) and 15-16 years of age (OR 2.21, 95% CI: 1.33, 3.74), alcohol use past year (OR 4.24, 95% CI: 3.02, 6.01), alcohol use before sex (OR 5.77, 95% CI: 3.81, 8.93), transactional sex (OR 2.70, 95% CI: 1.93, 3.81) and the reported youth center location: Kamwokya (OR 2.27, 95% CI: 1.29, 4.09), Nateete (OR 1.84, 95% CI: 1.02, 3.38) and Mukono (OR 2.04, 95% CI: 1.08, 3.93). In addition, two interactions with gender were significant in the bivariate analyses: ever lived on the streets (males: OR 1.57, 95% CI: 0.92, 2.67; females: OR 6.21, 95% CI: 3.59, 10.74) and transactional sex (males: OR 2.05, 95% CI: 1.01, 4.13; females: OR 5.24 95% CI: 3.27, 8.40).

In the multivariable analysis, the following sociodemographic variables were statistically significant and associated with reporting three or more lifetime sexual partners: age (AOR 2.37, 95% CI: 1.27, 1.70), African Tradition/Other religion (AOR 5.83, 95% CI: 2.14, 15.89), and both parents dead (AOR 1.83 95% CI: 1.03, 3.26).

We also found that age at sexual debut: 12 years or younger (AOR 13.13, 95% CI: 4.86, 35.44), 13-14 years of age (AOR 6.64, 95% CI: 3.24, 13.60) and 15-16 years of age (AOR 2.36, 95% CI: 1.28, 4.37) were statistically significant, in addition to alcohol use past year (AOR 2.01, 95% CI: 1.25, 3.24), alcohol use before sex (AOR 2.93, 95% CI: 1.65, 5.20), transactional sex (AOR 2.40, 95% CI: 1.47, 3.92) and slum location: Kamwokya (AOR 2.22, 95% CI: 1.04, 4.73). The results show a very strong association between early sexual debut and having three or more sexual partners. The youth reporting sexual debut at 12 years of age or younger had 13 times the odds of having three or more sexual partners, while those initiating sex at 13-14 years of age had over six times the odds of having multiple sexual partners. Alcohol use in the past year and alcohol use before sex were also significantly associated with having three or more lifetime sexual partners. The odds of having multiple sexual partners by youth who use alcohol before sex were nearly three times those of youth not reporting such behavior and twice the odds for youth reporting alcohol use in the past year. Transactional sex was also significantly associated with having three or more sexual partners. Those youth who engaged in transactional sex had twice the odds of having multiple sexual partners. With regarding to slum locations, after controlling for the other covariates, Kamwokya remained statistically significant. The youth at that location had over twice the odds of reporting three or more sexual partners than those youth in Bwaise.

The interaction of gender and ever lived on the streets was significant (males: AOR 1.25, 95% CI: 0.65, 2.38; females: OR 3.23, 95% CI: 1.61, 6.45) in the final multivariable model. For females, ever living on the streets was statistically significantly associated with having three or more sexual partners; however, the impact of ever living on the streets on having three or more sexual partners was not statistically significant for males. The interaction between gender and transactional sex was no longer statistically significant in the multivariable model.

3.3 Discussion

The overarching aim of this study was to identify and examine the individual and community-level factors which are associated with having multiple sexual partners among sexually active youth, ages 12-18, in the slums of Kampala. In pursuit of this aim, we examined the prevalence of reporting three or more lifetime sexual partners among the male and female youth in the addition to the characteristics of the youth and how they differ from those youth with only one to two lifetime partners. We also examined the sociodemographic and risk behavioral characteristics of the youth across the six youth centers to examine whether they differ by such distinct slum location and community.

We found that almost half (46.6%) of this sample of youth reported having three or more lifetime sexual partners. Given that incidence of HIV has been found to be highest among youth with the most numerous sexual partners (Chen et al., 2007; Grabowski et al., 2017), this prevalence is of great concern and even more so given the youth in this study were only 12-18 years of age compared to a recent study of 18-24 year old psychoactive substance users with a similar prevalence of multiple sexual partnerships (Ssekamatte et al., 2020).

Age, religion and both parents deceased were significantly associated with multiple sexual partnerships, but not less education, as has been reported in prior studies (Onoya et al., 2015; Pilgrim et al., 2015; Renzaho et al., 2017; Santelli et al., 2013; Toska et al., 2017; Wilson Chialepeh & Sathiyasusuman, 2015; Zuma et al., 2010). Girls were more likely to report multiple sexual partnerships than boys. In addition, for females, ever living on the streets was associated with having three or more sexual partners; however, the impact of ever living on the streets on multiple sexual partners showed no association for males. Such findings have implications for the risks and challenges faced by girls experiencing homelessness in the urban slums (Lyons et al., 2017).

Engaging in multiple partnerships through transactional or commercial sex work puts them at increased risk for acquiring and transmitting HIV (Renzaho et al., 2017; Ssekamatte et al., 2020; Swahn et al., 2016; Wamoyi et al., 2019). The social and economic vulnerabilities, along with limited opportunities of young women in informal settlements may force them into transactional sex that is likely to result in multiple partners (Onoya et al., 2015; Ssekamatte et al., 2020). Prevention of HIV infections in adolescent girls and young women remains a challenge in Africa, where most of the new HIV cases are among this group (UNAIDS, 2020; Wamoyi et al., 2016). A growing body of literature speculates that transactional sex may play a role in the disproportionate risk of HIV among young women (Magni et al., 2015; Wamoyi et al., 2016). These findings highlight the need to address the economic vulnerabilities of young women in the Kampala slums through vocational and skills training in addition to innovative financial support programs through cash transfer and micro-loan programs. Moreover, longitudinal studies among this understudied population of youth are needed to understand the pathways through which homelessness and transactional sex increase young women's risk for HIV.

To add to the critical nature of these findings, we found that only 24.6% of the youth reported consistent condom use and 56% reported not using a condom at first sex. As unprotected sex with multiple sexual partners is the greatest risk factor for HIV and other STIs among youth (Pilgrim et al., 2015; Santelli et al., 2013; Wilson Chialepeh & Sathiyasusuman, 2015), these vulnerable youth are in dire need of effective HIV prevention programs to promote protective sexual behavior. Moreover, more than two-thirds of the youth who reported having multiple sexual partners reported current use of alcohol and nearly four times as many reported alcohol use before sex. Alcohol use in the past year and alcohol use before sex were also statistically significant factors for engaging in lifetime multiple sexual partnerships. The use of alcohol and its role in sexual risk behaviors and related risk for HIV is of great concern from the public health perspective (Scribner et al., 2010; Tumwesigye et al., 2012; Wandera et al., 2015). Previous research among this population of youth found the prevalence of HIV much higher than the national average and found alcohol use associated with HIV (Culbreth et al., 2020; Swahn et al., 2019). Consistent with our findings, a recent study found engaging in multiple sexual partnerships in the last 30 days was statistically higher among the young adults in Kampala informal settlements who drank alcohol in the last 30 days (Ssekamatte et al., 2020). Another study of adolescents in rural Uganda found recent alcohol use to be associated with the number of lifetime sexual partners (Pilgrim et al., 2015). In addition, research in sub-Saharan Africa has found that the quantity of alcohol consumed was associated with having greater numbers of recent and concurrent sex partners (Kalichman et al., 2007). Past research has found that alcohol consumption before and during sex is common and especially among female sex workers in Kampala who report being paid in alcohol (Mbonye et al., 2014; Swahn et al., 2016). This is concerning, given that t 40% of the youth reported engaging in transactional sex and that transactional sex was associated with reporting multiple sexual partnerships. Given prior findings among this sample of youth that binge drinking is associated with unprotected condomless sex (Kumar et al., 2020) and the high prevalence of engaging in multiple sexual partnerships found in this study, programs need a multi-factorial approach to increase condom use, reduce the number of sexual partners and address the role of alcohol in risk sexual behaviors among these youth. The findings of this study highlight the need for programs that focus on delaying and reducing alcohol use combined with risky behavior reductions as a critical strategy for HIV prevention.

This study also found that age at sexual debut was a strong factor in multiple sexual partnerships. This is consistent with prior studies which have indicated that early sexual debut is a predictor of high-risk sexual behavior (Peltzer, 2010; Shrestha et al., 2016; Yode & LeGrand, 2012; Zuma et al., 2010) and a risk factor for HIV and STIs (Ghebremichael et al., 2009; Pettifor et al., 2009; Pettifor et al., 2004) among youth in sub-Saharan Africa. Over 40% of these youth reported sexual initiation at 14 years of age or younger. Delay of the age of sexual debut should be a critical part of multi-faceted behavioral programs combined with reduction in number of sexual partners and increasing condom use (Coates et al., 2008). In addition, such prevention programs should focus on youth in early adolescence before sexual debut as a way to protect health during adolescence.

Another important aim of this study was to determine whether multiple sexual partnerships and other risk behaviors of the youth differ by the slum locations of the youth centers. We found notable trends among the centers in risk behaviors reported by the youth. Makindye's youth reported the highest prevalence of ever lived on the streets, orphan status (both parents dead), early sexual debut (<15 years of age), alcohol use before sex, transactional sex and HIV-positive status and the lowest levels of consistent condom use and condom use at first sex. In contrast, Bwaise had the lowest level of orphans, early sexual debut (<15 years of age), alcohol use, alcohol use before sex, and HIV-positive youth, but the highest percentage of youth reporting both parents alive, consistent condom use and condom use at first sex. The prevalence of HIV of the youth in Makindye was 20 times the HIV prevalence in Bwaise. Alcohol use was highest in Mukono, Kamwokya, and Makindye. Although, we did not find a statistically significant difference in the number of lifetime multiple sex partners reported by the youth among the six centers, Bwaise was notably the lowest in prevalence and Kamwokya the highest. In the multivariable analyses, after controlling for demographic and other risk behaviors, the odds of youth in Kamwokya to report multiple sexual partnerships were significant and over twice that of Bwaise.

Clearly, the risk behaviors and health disparities of these youth vary greatly across the six slums of Kampala. Although these slums are close in proximity to each other, the findings highlight the need for further investigation of the slum characteristics and multi-level factors contributing to such variation including the built environment, access to services and structural drivers (Latkin et al., 2013; Parkhurst, 2014). Given the limited literature in sub-Saharan Africa on how community-level factors and neighborhood characteristics may influence sexual behaviors ((Mimiaga et al., 2015; Onoya et al., 2015; Scribner et al., 2010; Stephenson, 2009), future research is needed to inform and operationalize structural interventions to address the health needs and disparities of these vulnerable youth in the slums (Parkhurst, 2014). In addition, a future survey should include youth center-level questions to account for any differences in the programming and youth experience at each center.

Despite strengths of this study, it was subject to several important limitations. First, the study utilized a cross-sectional convenience sample. However, this population is difficult to reach and is understudied; therefore, the collection of this data provides an invaluable insight to this population. Because of the cross-sectional design, this study did not assess temporality and cannot infer causality. Sensitive topics were used in the questionnaire, and misclassification may be present and have likely produced an underestimate of the overall and true prevalence of risky behaviors in the population. Self-reporting over the past time periods is subject to recall bias. Second, the lifetime multiple sexual partners survey question could not be operationalized to compare one lifetime partner to multiple sexual partners due to the response categories. Third, we were not able to examine concurrency and concurrent partners as such questions were not included in the survey. Fourth, we could not account for center-level effects in the analyses due to the nature of the data.

Future studies are needed for a longitudinal analysis of risk behaviors and HIV, in addition to a slum rating index and inclusion of center-level attributes.

This study examined individual and community level factors that may be drivers of multiple sexual partnerships. The high prevalence of having multiple sexual partners among youth of only 12-18 years of age highlights the critical need for effective interventions to address early sexual initiation, transactional sex and alcohol use. Moreover, given the low prevalence of consistent condom use, it is even more important to address the spectrum of high-risk behaviors at an early age for HIV prevention. Recruitment of younger adolescents around the drop-in centers should be a priority to promote protective health behaviors in early adolescence. In addition, this study examined whether sexual behaviors, including multiple sexual partnerships, differed across the slum locations. We found unexpected heterogeneity and variation in the sexual behaviors reported by the youth across these locations. Such findings highlight the need for future research to explore the drivers of such variation, including an examination of the center and slum neighborhood characteristics and built environment. Effective programs for these service-seeking youth may need to be tailored to each center and slum location based on their unique attributes.

References

Bronfenbrenner, U. (1992). *Ecological systems theory*. Jessica Kingsley Publishers.

Chen, L., Jha, P., Stirling, B., Sgaier, S. K., Daid, T., Kaul, R., Nagelkerke, N., & International Studies of, H. I. V. A. I. (2007, Oct 3). Sexual risk factors for HIV infection in early and advanced HIV epidemics in sub-Saharan Africa: systematic overview of 68 epidemiological studies. *PLoS One*, *2*(10), e1001. https://doi.org/10.1371/journal.pone.0001001

Coates, T. J., Richter, L., & Caceres, C. (2008, Aug 23). Behavioural strategies to reduce HIV transmission: how to make them work better. *Lancet, 372*(9639), 669-684. https://doi.org/10.1016/S0140-6736(08)60886-7

Cowan, F., & Pettifor, A. (2009, Jul). HIV in adolescents in sub-Saharan Africa. *Curr Opin HIV AIDS*, *4*(4), 288-293. https://doi.org/10.1097/COH.0b013e32832c7d10

Culbreth, R., Swahn, M. H., Ndetei, D., Ametewee, L., & Kasirye, R. (2018). Suicidal ideation among youth living in the slums of Kampala, Uganda. *International Journal of Environmental Research and Public Health, 15*(2), 298.

Culbreth, R., Swahn, M. H., Salazar, L. F., Ametewee, L. A., & Kasirye, R. (2020). Risk factors associated with HIV, sexually transmitted infections (STI), and HIV/STI co-infection among youth living in the slums of Kampala, Uganda. *AIDS and Behavior*, *24*(4), 1023-1031.

DiClemente, R. J., & Crosby, R. A. (2009, Feb). Preventing HIV among adolescents in Sub-Saharan Africa. *J Adolesc Health, 44*(2), 101-102. https://doi.org/10.1016/j.jadohealth.2008.12.001

Dietrich, J., Sikkema, K., Otwombe, K. N., Sanchez, A., Nkala, B., de Bruyn, G., Van Der Watt, M., & Gray, G. E. (2013, Jul 1). Multiple levels of influence in predicting sexual activity and condom use among adolescents in Soweto, Johannesburg, South Africa. *J HIV AIDS Soc Serv*, *12*(3-4), 404-423. https://doi.org/10.1080/15381501.2013.819312

Ghebremichael, M., Larsen, U., & Paintsil, E. (2009, Sep). Association of age at first sex with HIV-1, HSV-2, and other sexual transmitted infections among women in northern Tanzania. *Sex Transm Dis, 36*(9), 570-576. https://doi.org/10.1097/OLQ.0b013e3181a866b8

Grabowski, M. K., Serwadda, D. M., Gray, R. H., Nakigozi, G., Kigozi, G., Kagaayi, J., Ssekubugu, R., Nalugoda, F., Lessler, J., Lutalo, T., Galiwango, R. M., Makumbi, F., Kong, X., Kabatesi, D., Alamo, S. T., Wiersma, S., Sewankambo, N. K., Tobian, A. A. R., Laeyendecker, O., Quinn, T. C., Reynolds, S. J., Wawer, M. J., Chang, L. W., & Rakai Health Sciences, P. (2017, Nov 30). HIV Prevention Efforts and Incidence of HIV in Uganda. *N Engl J Med, 377*(22), 2154-2166. https://doi.org/10.1056/NEJMoa1702150

Kalichman, S. C., Simbayi, L. C., Kaufman, M., Cain, D., & Jooste, S. (2007). Alcohol use and sexual risks for HIV/AIDS in sub-Saharan Africa: systematic review of empirical findings. *Prevention science, 8*(2), 141.

Kumar, S., Culbreth, R. E., Swahn, M. H., & Kasirye, R. (2020). Examining correlates of alcohol related condom-less sex among youth living in the slums of Kampala, Uganda. *AIDS care, 32*(10), 1246-1250.

Latkin, C. A., German, D., Vlahov, D., & Galea, S. (2013). Neighborhoods and HIV: a social ecological approach to prevention and care. *American Psychologist, 68*(4), 210.

Lyons, M., Swahn, M. H., Whitaker, D., Brown, J. R., Kasper, J., & Culbreth, R. (2017). Associations of lifetime prevalence of homelessness with risky sex, sexual victimization, depressive symptoms, and suicidality among youth in Kampala, Uganda. *International Social Work*, 0020872819847753.

Magni, S., Christofides, N., Johnson, S., & Weiner, R. (2015). Alcohol Use and Transactional Sex among Women in South Africa: Results from a Nationally Representative Survey. *PLoS One, 10*(12), e0145326. https://doi.org/10.1371/journal.pone.0145326

Mbonye, M., Rutakumwa, R., Weiss, H., & Seeley, J. (2014). Alcohol consumption and high risk sexual behaviour among female sex workers in Uganda. *Afr J AIDS Res, 13*(2), 145-151. https://doi.org/10.2989/16085906.2014.927779

Mimiaga, M. J., Closson, E. F., Safren, S. A., Mabude, Z., Mosery, N., Taylor, S. W., Perez-Brumer, A., Matthews, L. T., Psaros, C., Harrison, A., Grelotti, D. J., Bangsberg, D. R., & Smit, J. A. (2015, Feb). Inkwari: an emerging high-risk place potentiating hiv spread among young adults in a hyper-endemic South African setting. *Arch Sex Behav, 44*(2), 307-315. https://doi.org/10.1007/s10508-014-0330-2

Ministry of Health. (2017). *Adolescent Health Risk Behaviors in Uganda: A National Cross Sectional Study 2017*. M. o. Health. http://library.health.go.ug/publications/adolescent-health/adolescent-health-risk-behaviors-uganda-national-cross-sectional

Muchiri, E., Odimegwu, C., Banda, P., Ntoimo, L., & Adedini, S. (2017, Jul). Ecological correlates of multiple sexual partnerships among adolescents and young adults in urban Cape Town: a cumulative risk factor approach. *Afr J AIDS Res, 16*(2), 119-128. https://doi.org/10.2989/16085906.2017.1318762

Onoya, D., Zuma, K., Zungu, N., Shisana, O., & Mehlomakhulu, V. (2015, Mar). Determinants of multiple sexual partnerships in South Africa. *J Public Health (Oxf), 37*(1), 97-106. https://doi.org/10.1093/pubmed/fdu010

Parkhurst, J. O. (2014). Structural approaches for prevention of sexually transmitted HIV in general populations: definitions and an operational approach. *J Int AIDS Soc, 17*, 19052. https://doi.org/10.7448/IAS.17.1.19052

Peltzer, K. (2010, Aug). Early sexual debut and associated factors among in-school adolescents in eight African countries. *Acta Paediatr*, *99*(8), 1242-1247. https://doi.org/10.1111/j.1651-2227.2010.01874.x

Perry, E. W., Culbreth, R., Swahn, M., Kasirye, R., & Self-Brown, S. (2020). Psychological distress among orphaned youth and youth reporting sexual exploitation in Kampala, Uganda. *Children and Youth Services Review*, *119*, 105587.

Pettifor, A., O'Brien, K., Macphail, C., Miller, W. C., & Rees, H. (2009, Jun). Early coital debut and associated HIV risk factors among young women and men in South Africa. *Int Perspect Sex Reprod Health, 35*(2), 82-90. https://doi.org/10.1363/ifpp.35.082.09

Pettifor, A. E., Rees, H. V., Kleinschmidt, I., Steffenson, A. E., MacPhail, C., Hlongwa-Madikizela, L., Vermaak, K., & Padian, N. S. (2005, Sep 23). Young people's sexual health in South Africa: HIV prevalence and sexual behaviors from a nationally representative household survey. *AIDS, 19*(14), 1525-1534. https://doi.org/10.1097/01.aids.0000183129.16830.06

Pettifor, A. E., van der Straten, A., Dunbar, M. S., Shiboski, S. C., & Padian, N. S. (2004, Jul 2). Early age of first sex: a risk factor for HIV infection among women in Zimbabwe. *AIDS, 18*(10), 1435-1442. https://doi.org/10.1097/01.aids.0000131338.61042.b8

Pilgrim, N. A., Ahmed, S., Gray, R. H., Sekasanvu, J., Lutalo, T., Nalugoda, F., Serwadda, D., & Wawer, M. J. (2015, Aug). Multiple sexual partnerships among female adolescents in rural Uganda: the effects of family structure and school attendance. *Int J Adolesc Med Health, 27*(3), 319-328. https://doi.org/10.1515/ijamh-2014-0032

Renzaho, A. M., Kamara, J. K., Georgeou, N., & Kamanga, G. (2017). Sexual, Reproductive Health Needs, and Rights of Young People in Slum Areas of Kampala, Uganda: A Cross Sectional Study. *PLoS One*, *12*(1), e0169721. https://doi.org/10.1371/journal.pone.0169721

Santelli, J. S., Brener, N. D., Lowry, R., Bhatt, A., & Zabin, L. S. (1998, Nov-Dec). Multiple sexual partners among U.S. adolescents and young adults. *Fam Plann Perspect*, *30*(6), 271-275. https://www.ncbi.nlm.nih.gov/pubmed/9859017

Santelli, J. S., Edelstein, Z. R., Mathur, S., Wei, Y., Zhang, W., Orr, M. G., Higgins, J. A., Nalugoda, F., Gray, R. H., Wawer, M. J., & Serwadda, D. M. (2013, Jul 1). Behavioral, biological, and demographic risk and protective factors for new HIV infections among youth in Rakai, Uganda. *J Acquir Immune Defic Syndr*, *63*(3), 393-400. https://doi.org/10.1097/QAI.0b013e3182926795

Scribner, R., Theall, K. P., Simonsen, N., & Robinson, W. (2010). HIV risk and the alcohol environment: advancing an ecological epidemiology for HIV/AIDS. *Alcohol Res Health*, *33*(3), 179-183. https://www.ncbi.nlm.nih.gov/pubmed/23584059

Self-Brown, S., Culbreth, R., Wilson, R., Armistead, L., Kasirye, R., & Swahn, M. H. (2018). Individual and parental risk factors for sexual exploitation among high-risk youth in Uganda. *Journal of interpersonal violence*, 0886260518771685.

Shrestha, R., Karki, P., & Copenhaver, M. (2016, Feb). Early Sexual Debut: A Risk Factor for STIs/HIV Acquisition Among a Nationally Representative Sample of Adults in Nepal. *J Community Health*, *41*(1), 70-77. https://doi.org/10.1007/s10900-015-0065-6

Ssekamatte, T., Tetui, M., Kibira, S. P. S., Isunju, J. B., Mugambe, R. K., Nabiwemba, E., Wafula, S. T., Buregyeya, E., & Bukenya, J. N. (2020). Multiple sexual partnerships and associated factors among young psychoactive-substance-users in informal settlements in Kampala, Uganda. *PLoS One*, *15*(10), e0239323. https://doi.org/10.1371/journal.pone.0239323

Stephenson, R. (2009, Jan). Community influences on young people's sexual behavior in 3 African countries. *Am J Public Health*, *99*(1), 102-109. https://doi.org/10.2105/AJPH.2007.126904

Swahn, M. H., Braunstein, S., Palmier, J. B., Kasirye, R., & Yao, H. (2014). Disparities in sexual activity indicators among youth living in the slums of Kampala: Comparisons with representative national and urban school-attending youth. *International STD Research & Reviews*, 21-28.

Swahn, M. H., Culbreth, R., Salazar, L. F., Kasirye, R., & Seeley, J. (2016). Prevalence of HIV and Associated Risks of Sex Work among Youth in the Slums of Kampala. *AIDS Res Treat*, *2016*, 5360180. https://doi.org/10.1155/2016/5360180

Swahn, M. H., Culbreth, R., Salazar, L. F., Tumwesigye, N. M., Jernigan, D. H., Kasirye, R., & Obot, I. S. (2020). The Prevalence and Context of Alcohol Use, Problem Drinking and

Alcohol-Related Harm among Youth Living in the Slums of Kampala, Uganda. *International Journal of Environmental Research and Public Health, 17*(7), 2451.

Swahn, M. H., Culbreth, R., Salazar, L. F., Tumwesigye, N. M., & Kasirye, R. (2019). Psychosocial correlates of self-reported HIV among youth in the slums of Kampala. *BMC public health, 19*(1), 1176.

Swahn, M. H., Culbreth, R., Staton, C. A., & Kasirye, R. (2017). Psychosocial health concerns among service-seeking orphans in the slums of Kampala. *Vulnerable children and youth studies, 12*(3), 258-263.

Swahn, M. H., Gressard, L., Palmier, J. B., Kasirye, R., Lynch, C., & Yao, H. (2012). Serious violence victimization and perpetration among youth living in the slums of Kampala, Uganda. *Western journal of emergency medicine, 13*(3), 253.

Swahn, M. H., Palmier, J. B., Kasirye, R., & Yao, H. (2012). Correlates of suicide ideation and attempt among youth living in the slums of Kampala. *International Journal of Environmental Research and Public Health*, *9*(2), 596-609.

Toska, E., Pantelic, M., Meinck, F., Keck, K., Haghighat, R., & Cluver, L. (2017). Sex in the shadow of HIV: A systematic review of prevalence, risk factors, and interventions to reduce sexual risk-taking among HIV-positive adolescents and youth in sub-Saharan Africa. *PLoS One*, *12*(6), e0178106. https://doi.org/10.1371/journal.pone.0178106

Tumwesigye, N. M., Wanyenze, R. K., & Greenfield, T. K. (2012). Intoxication before last sexual intercourse and HIV risk behavior among men and women in Uganda: Evidence from a nationwide survey. *The International Journal of Alcohol and Drug Research, 1*(1).

Uganda Ministry of Health. (2019). *Uganda population-based HIV impact assessment (UPHIA) 2016–2017*. http://uac.go.ug/sites/default/files/UPHIA%20Final%20Report%20%5B2016%20-%202017%5D.pdf

UNAIDS. (2020). *Global AIDS update 2020*. World Health Organization. Retrieved January 25, 2020 from https://www.unaids.org/sites/default/files/media_asset/2020_global-aids-report_en.pdf

United Nations. (2018). *World Urbanization Prospects: The 2018 Revision*. Department of Economic and Social Affairs Population Division. https://population.un.org/wup/Publications/Files/WUP2018-KeyFacts.pdf

Van Leeuwen, J. M., Sekeramayi, T., Martell, C., Feinberg, M., & Bowersox-Daly, S. (2017). A baseline analysis of the Katanga slums: informing urban public policy in Kampala, Uganda. *African Population Studies*, *31*(2).

Wamoyi, J., Ranganathan, M., Kyegombe, N., & Stoebenau, K. (2019, Apr 1). Improving the Measurement of Transactional Sex in Sub-Saharan Africa: A Critical Review. *J Acquir Immune Defic Syndr*, *80*(4), 367-374. https://doi.org/10.1097/QAI.0000000000001928

Wamoyi, J., Stobeanau, K., Bobrova, N., Abramsky, T., & Watts, C. (2016). Transactional sex and risk for HIV infection in sub-Saharan Africa: a systematic review and meta-analysis. *J Int AIDS Soc*, *19*(1), 20992. https://doi.org/10.7448/IAS.19.1.20992

Wandera, B., Tumwesigye, N. M., Nankabirwa, J. I., Kambugu, A. D., Parkes-Ratanshi, R., Mafigiri, D. K., Kapiga, S., & Sethi, A. K. (2015). Alcohol consumption among HIV-infected persons in a large urban HIV clinic in Kampala Uganda: a constellation of harmful behaviors. *PLoS One*, *10*(5), e0126236.

Wilson Chialepeh, N., & Sathiyasusuman, A. (2015). Associated Risk Factors of STIs and Multiple Sexual Relationships among Youths in Malawi. *PLoS One*, *10*(8).

Yebra, G., Ragonnet-Cronin, M., Ssemwanga, D., Parry, C. M., Logue, C. H., Cane, P. A., Kaleebu, P., & Brown, A. J. L. (2015). Analysis of the history and spread of HIV-1 in Uganda using phylodynamics. *The Journal of general virology*, *96*(Pt 7), 1890-1898. https://doi.org/10.1099/vir.0.000107

Yode, M., & LeGrand, T. (2012, Jun). Association between age at first sexual relation and some indicators of sexual behaviour among adolescents. *Afr J Reprod Health*, *16*(2), 173-188. https://www.ncbi.nlm.nih.gov/pubmed/22916550

Zuma, K., Setswe, G., Ketye, T., Mzolo, T., Rehle, T., & Mbelle, N. (2010, Jun). Age at sexual debut: a determinant of multiple partnership among South African youth. *Afr J Reprod Health*, *14*(2), 47-54. https://www.ncbi.nlm.nih.gov/pubmed/21243918

Chapter 4

Paper 3: Latent Classes of Sexual Risk Behavior, HIV Risk Patterns and Parental Factors among Youth Living in the Slums of Kampala

4.0 Introduction

High-risk behavior among children and adolescents living in the slums of sub-Saharan Africa presents a public health concern due to their dire circumstances and unmet health needs (Blum, 2007). These youth face the challenges of economic hardship, family conflict and disruption, abuse, and maltreatment and are often predisposed to situational and lifestyle factors that result in living on the streets, in the slums, or in other compromised living situations (Kabiru et al., 2013; le Roux & Smith, 1998; Mufune, 2000; Tyler et al., 2013). Street children are exposed to high levels of poverty, family conflict, and low parental attachment, well as alcohol and drug use, which have been well- established risk factors for interpersonal violence and further victimization (Swahn et al., 2018). Previous research shows the vulnerability of youth in the slums of Kampala due to food scarcity, orphan status and limited infrastructure (Lyons et al., 2017; Swahn, Culbreth, Staton, & Kasirye, 2017; Swahn, Culbreth, Staton, Self-Brown, et al., 2017; Swahn, Gressard, et al., 2012; Swahn, Palmier, et al., 2012). Such research among street and slum youth also indicates relatively high levels of interpersonal violence among youth in Kampala (Swahn, Gressard, et al., 2012). In addition, these vulnerable youth in Kampala have a much higher HIV prevalence (Swahn et al., 2019) (Swahn, Culbreth, Salazar, Tumwesigye & Kasirye, 2019) than the general population of Uganda (Uganda Ministry of Health, 2019).

Given the disproportionate burden of HIV and STIs on the street and slum youth (Culbreth et al., 2020; Swahn et al., 2019), understanding the factors that influence high-risk and protective sexual behaviors among this age group is critical to the development of tailored interventions to address this burden. Protective sexual behavior has been conceptualized as behaviors focused on prevention of STIs and/or unplanned pregnancies by sexually active or those who have ever had sex (Ajayi & Okeke, 2019). Sexual behavior has been viewed as a continuum, with the higher end of the risk spectrum composed of those who engage in unprotected sex with multiple sexual partners while those who abstain from sex reside at the lower end of the risk continuum (Cort & Tu, 2018).

In a recent cross-sectional study of adolescents and young adults in Nigeria, Ajayi and Okeke (2019) examined the influence of family support, and living with both parents, on protective sexual behaviors and also the gender differences thereof. The study found that family support and living with both parents were positively associated with protective sexual behaviors among these adolescents and young adults; however, the researchers found no gender differences in protective sexual behaviors, including sexual abstinence, consistent condom use and sexual fidelity (Ajayi & Okeke, 2019).

Significant gender difference in sexual behavior have been noted among young people in sub-Saharan Africa (Odimegwu et al., 2019), including evidence that sexual initiation occurs earlier among females compared to males (Amo-Adjei & Tuoyire, 2018) while males are more likely to have multiple sexual partners than females (Doyle et al., 2012). Ajayi and Okeke (2019) noted that it remains unclear whether gender differences exist in protective sexual behavior of adolescents and young adults in this context and region. In addition, they point out that “the practice of protective sexual behavior and its determinants among this cohort has received little attention.”(Ajayi & Okeke, 2019)

Family structure literature shows that growing up without both parents is associated with a range of poor child outcomes such as higher poverty rates, lower levels of education and occupational attainment than those who grow up with both biological or adoptive parents (Musick & Meier, 2010). Children from single-parent and step-parent families report great substance use and risk-taking behavior (Carlson, 2006; Musick & Meier, 2010) and are more likely to have early sexual initiation (Davis & Friel, 2001).

Family is one social and ecological context which influences the risk and sexual behavior of youth, remains understudied in sub-Saharan Africa (Pilgrim et al., 2014). Improved understanding of the influences of family context and the pressures exerted by the family on their individual members (Adepoju & Mbunga, 1997) is essential to changing HIV-related population parameters such as age of sexual debut (Pilgrim et al., 2014)

Studies have shown that orphan status is associated with risk behavior of youth and young people in the slums of Kampala (Swahn, Culbreth, Staton, & Kasirye, 2017). Adolescent girls in Uganda were significantly more likely to debut sexually if neither parent resided in the household (Pilgrim et al., 2014). Other family-related factors such as parental alcohol use, socio-economic status and living on the streets and associated family instability have also been found to influence the sexual behaviors of youth (Self-Brown et al., 2018).

At the family level of influence, the parent-adolescent relationship is an opportunity for parents to engage their adolescents in increasing health-promoting behaviors, such as the expectation to use and carry condoms (Dietrich et al., 2013). In general, living with biological parents, especially the biological mother, tends to be protective by promoting consistent condom use. Evidence suggests that these effects operate not through parent-child communications but rather through parental monitoring**,** in which parents know what their adolescents are doing and the effect is that the adolescents are more likely to protect themselves than those whose parents know little or nothing about their activities (Bankole, Biddlecom, et al., 2007; Reynolds et al., 2013).

Conceptual Framework

The Social Control Theory focuses on parental control over children's behavior, "whereby parental supervision and monitoring reduces adolescents' opportunities for sexual activity" (Pilgrim et al., 2014). Due to the HIV epidemic's damage to the family structure in sub-Saharan Africa, it is estimated that 30% of Ugandan adolescents aged 12-19 do not live with a biological parent (Defo & Dimbuene, 2012; Neema et al., 2004). Previous studies have shown, using the Social Control Theory, that fathers have a protective effect and that in patriarchal societies such as Uganda, father have expectations as to proper sexual behavior (Mirembe & Davies, 2001). Consistent with this theory is that girls without resident fathers may lack protection and become targets for sexual exploitation (Kawai et al., 2008; Pilgrim et al., 2014). A clear understanding of the role of family and parental support and family structure on protective sexual behavior "is vital in informing programmes and policies in the continued efforts aimed at reducing STIs and unplanned pregnancy" (Ajayi & Okeke, 2019).

Study Aims and Research Questions

This paper aims to explore patterns of sexual risk behaviors using latent class analysis (LCA) and to examine socio-demographic and parental-influence covariates associated with each identified class. Although many studies have looked at risk factors associated with HIV among adults and youth, few have examined patterns or classes of sexual behavior that could describe the heterogeneity of vulnerable youth (Noor et al., 2014). Departing from existing research that utilized a binary view of sexual behaviors or a variable-centered approach, this study shall utilize latent class analysis to identify patterns of sexual behaviors of youth, 12-18 years of age, living in the slums of and provide novel insight into how a youth's comprehensive spectrum of risk behaviors interact to predict HIV risk. Ultimately, by exploring the patterns of sexual risk behavior, HIV risk and predictors of these behavioral patterns, we can create and improve the programs and interventions for these uniquely vulnerable youth.

Latent class analysis (LCA) is a statistical methodology that can provide mathematical justification for distinct groups, or classes, through mixture modeling, and has been used to examine risk profiles of other populations at risk for HIV transmission (Mackesy-Amiti et al., 2018; Noor et al., 2014). The guiding research questions are as follows: 1) How many identifiable groups of participants can be classified based on similar risk characteristics in their reported sexual behaviors?; 2) What are the correlates of the identified risk classes, including demographic and psychosocial characteristics, risk behaviors and parental living status and monitoring?

4.1 Methods

The current study is based on the "Kampala Youth Survey 2014", a cross-sectional survey conducted in March and April 2014 to quantify and examine high-risk behaviors and exposures, with a focus on alcohol use, sexual behaviors and HIV, in a convenience sample of urban youth, 12-18 years of age, living in the slums or on the streets of Kampala, Uganda, who were participating in a Uganda Youth Development Link (UYDEL) drop-in center for disadvantaged street and slum youth. UYDEL serves on average 3000 youth per month through six drop-in centers throughout the slums of Kampala.

Participants and Recruitment

Each social worker and peer educator received comprehensive training on the study methodology, interpretation of each survey question and its translation into Luganda (the local language), if needed. In addition, the social workers and peer educators received training on recruitment and consent methods in order to facilitate potential participants among attendants at their specific youth drop-in center. Study participants were recruited through convenience sampling of the youth at six drop-in centers and the neighborhoods surrounding the UYDEL drop-in centers primarily through word-of-mouth. Face-to-face interviews were conducted by social workers and peer educators employed by UYDEL with previous experience working with youth within the targeted drop-in centers and communities. Over the 15-day (March 19 to April 2) survey collection period, 1628 youth were approached for participating in the survey. Among these youth, 131 declined, yielding a participation rate of 92%. A total of 1,497 surveys were collected, including 43 pilot cases. Three hundred and twenty (320) surveys were lost due to technical issues with the survey software and server, yielding 1,134 completed surveys for the final analytic sample of youth between the ages of 12 and 18 (44% boys, 56% girls). Participants were informed about the study and read (or were read to) the consent forms to indicate their willingness to take the survey. All participants provided verbal consent to participate in the study. Participation was limited to youth ages 12-18 present in-person on of the day the field visit. There were no other exclusion criteria. Recruited youth received a small snack as incentive for participating in the survey. IRB approvals were obtained from the Georgia State University and the Uganda National Council on Science and Technology to conduct this study in Kampala. The Kampala Youth Survey 2014 was administered to the participants on Google Nexus 7 tablets using survey software. The use of tablets as an "mHealth" technology allowed for easier administration of the survey and streamlined data collection. UYDEL interviewers received a one-day training on survey administration protocols and the use of the tablet. Interviewers were also assigned a tablet with a unique identifier to be used over the course of the survey administration. During training interviewers were instructed to read the survey questions exactly as they appeared on the tablet screen after obtaining consent from the participants. The tablets were programmed to notify the interviewers of any missed questions and also processed skip patterns automatically for more accurate data collection.

Survey Measures

The Kampala Youth Survey 2014 was based on previously validated quantitative measures to assess alcohol use, violence perpetration and victimization, prevalence of alcohol marketing, sexual behaviors and mental health among adolescents and has been previously described (Swahn et al., 2019). Participants were queried on demographics, alcohol usage, perception and beliefs related to alcohol and sex as well as their knowledge of HIV/AIDS and other sexually transmitted infections (STIs). Questions included in the survey were collected from previously validated instruments used in the United States and globally to measure alcohol and sexual related behavior as well as mental health, including; Global School-based Student Health Survey (GSHS), Kampala Youth Survey 2011, MAMPA 2012 Questionnaire, CAGE Questionnaire, iMPPACS, AIDS Indicator Survey and the Demographic Health Survey. The survey was available to participants in both English and Luganda (the local language). All survey translation was conducted by a certified Luganda translator and back-translated for accuracy.

For the purposes of this study, analyses included all male and female participants, 12-18 years of age, who reported ever having engaged in sexual activity in response to that survey question (See Table 2 for characteristics of study participants).

Measures

The main variables of interest for the latent class analysis were questions regarding sexual behaviors. In this LCA, the latent variable represents categories of underlying risk that could cause infection with HIV. A total of eight (8) sexual behavior variables were selected based on their association with HIV risk: *Condom use at first sex* (yes/no), condom use at last sex (yes/no), *Consistent condom use* (always, most of the time, sometimes, never), *Lifetime sexual partners* (None, 1-2 partners, 3-4 partners, 5-6 partners, More than 6); age of sexual debut(<12, 13-14, 15-16, 17-18); Not using condom because of alcohol use (Never, 1-2 times, 3 or more times); Having sex with multiple partners because of alcohol use (Never, 1-2 times, 3 or more times); *Traded sex* (Yes/No). (*See Table 1 for wording of measures and computed variables*).

Of the eight variables, the following variables were recategorized: *Consistent condom use* categorized as "consistent" if respondent answered "always" and "inconsistent" if response was "most of the time", "sometimes" or "never; *Lifetime sexual partners* was dichotomized as "2 or fewer partners (≤2)" and "3 or more partners (≥3)". Age of sexual debut shall be dichotomized as "<15 years of age" and "≥15 years of age". Not using condom because of alcohol use (*Alcohol no condom use*) and having sex with multiple partners because of alcohol use (*Alcohol multiple partners*) shall be recategorized as "Yes" if respondent answered "1-2 times, or 3 or more times and "No" if response was "Never".

Covariates

Socio-demographic and other individual-level variables were examined based on the literature, including age, sex, education, having ever lived on the streets (Lyons et al., 2017). In the descriptive analyses, *Age* was measured as a categorical variable with three categories: 12-14, 15-16, 17-18; in the multinomial regression analyses, age was included as a continuous variable due to low cell sizes and lack of precision. *Education* was categorized as Less than Primary, Primary or less and Secondary or higher. Risk behaviors included history of any sexually transmitted infection (STI) during lifetime; HIV status and alcohol use before sex; Alcohol use has been shown to be associated with risky sexual behaviors, HIV and STIs among youth in sub-Saharan Africa and slum youth in Kampala (Ariza-Mejia et al., 2013; Kalichman et al., 2010; Kalichman et al., 2007; Swahn et al., 2019). Alcohol risk behavior, *Alcohol before sex*, was assessed with the following questions: Do you drink alcohol before having sexual intercourse? Respondents could answer “yes” or “no”

Parental-factor variables: Parental Living Status was categorized as both parents are alive, one parent living or both parents are dead. *Parental Monitoring* was operationalized as “high” or “low” based on parental survey questions. *Parental monitoring* were classified as “high” if the participant answered “Agree” to the following questions: My parents would be upset if they found out that I’m drinking alcohol (Agree, Neither Agree or Disagree, Disagree) My parents would be upset if they found out that I am having sex (Agree, Neither Agree or Disagree, Disagree) My parents think I should carry a condom if I plan to have sex ((Agree, Neither Agree or Disagree, Disagree); and if the respondent answered “No” or “They did not drink” to the question: Did your parent’s/caretaker’s alcohol use make them not able to care for you? (Yes, No, They did not drink). *Parental monitoring* was classified as “low” if the participant answered “Disagree” or “Neither agree or disagree” to the following questions: My parents would be upset if they found out that I’m drinking alcohol (Agree, Neither Agree or Disagree, Disagree) My parents would be upset if they found out that I am having sex (Agree, Neither Agree or Disagree, Disagree) My parents think I should carry a condom if I plan to have sex ((Agree, Neither Agree or Disagree, Disagree); and if the respondent answered “Yes” to Did your parent’s/caretaker’s alcohol use make them not able to care for you?

Table 1. Wording of Measures and Response Choices

Variable	Survey Question	Response Choices	Computed Variable
Sex	What is your sex?	Boy, Girl	
Age	How old are you?	12 years, 13, 14, 15, 16, 17, 18	12-14 years 15-16 years 17-18 years
Education	What level of education did you complete?	Never been to school, Primary, Secondary, Tertiary, Some Primary, Some Secondary, Some Tertiary	Primary or less, Completed primary, Secondary or higher
Ever Lived on the Streets	Have you ever lived on the streets with no other place to go?	Yes, No	
Ever had STI	Have you been told by a doctor/nurse or HIV counselor that you have a sexually transmitted infection such syphilis, herpes, bola, bola or gonorrhea?	Yes, No	
HIV-positive	Have you been told by a doctor/nurse or HIV counselor that you have HIV?	Yes, No	
Alcohol Use Before Sex	Do you drink alcohol before having sexual intercourse?	Yes, No	
Parental Living Status	Are one or both of your parents alive?	Both parents alive, Both parents dead, One parent alive	
Parental Monitoring	1. My parents would be upset if they found out that I'm drinking alcohol 2. My parents would be upset if they found out that I am having sex	Agree, Neither Agree or disagree, Disagree	If 'agree' to 1-3 and 'no' to 4, then "Monitor" = High If 'disagree' to 1-3 and 'yes' to 4,

	3. My parents think I should carry a condom if I plan to have sex	Yes, No	then "Monitor" = Low
	4. Did your parent's/caretaker's alcohol use make them not able to care for you?		
Sexual behaviors included in LCA			
Condom use first sex	Did you use a condom the first time you had sexual intercourse?	Yes, No	Condomfirst
Condom use last sex	Did you use a condom the last time you had sexual intercourse?	Yes, No	Condomlast
Consistent condom use	In the past three months, how often did you or your partner use a condom when having sexual intercourse?	Never, Sometimes, Most of the time, Always	CCUR Consistent = Always Inconsistent = Never, Sometimes, Most of the time
Lifetime sexual partners	With how many different partners have you had sexual intercourse in your lifetime?	None, 1-2 partners, 3-4 partners, 5-6 partners, More than 6	Sexpart3 2 or fewer (≤ 2) 3 or more (≥ 3)
Early sexual debut	How old were you when you had sexual intercourse for the first time?	<12, 13-14, 15-16, 17-18	Early < 15, ≥ 15
Alcohol No Condom Use	Because of your own alcohol use, how often during the last 12 months have you had sex without a condom?	Never, 1-2 times, 3 or more times	Alcondom Yes = 1-2 times, 3 or more times No = Never
Alcohol Multiple Partners	Because of your own alcohol use, how often during the last 12 months have you had sex with multiple partners?	Never, 1-2 times, 3 or more times	Alcmsp Yes = 1-2 times, 3 or more times No = Never

Traded Sex	Have you ever gotten money, food or other things for having sexual intercourse with someone?	Yes, No

Data analysis:

Latent Class Analyses to identify classes of sexual risk behavior

Latent class analysis (LCA) was used to identify distinct groups, or classes, of sexual risk behaviors. LCA is a statistical method used to assess observed variables by exploring inter-relationships to characterize latent, or unobserved, constructs. LCA is person-centered, thus allowing the grouping of individuals who are similar into classes (Hagenaars & McCutcheon, 2002). LCA was conducted using Mplus (Version 8.1)(Muthén & Muthén, 2017).

To identify the appropriate number of latent classes, we fit latent class models with an increasing number of classes (two to five) using the observed variables collected to assess sexual risk behaviors. Bayesian information criteria (BIC), Akaike information criteria (AIC), Consistent Akaike's Information Criterion (CAIC), Approximate Weight of Evidence Criterion (AWE) and the Lo-Mendell-Rubin likelihood ratio test (LMR-LRT) were used for model selection. Lower BIC values indicate a better fit, but the LMR-LRT assists in comparing LCA models with different classes and produces a *p* value to compare the class models (Noor et al., 2014). Entropy estimates (Table 3) were examined for class identification quality with higher values indicating better classification of individuals (Asparouhov & Muthén, 2018). Based on the selected latent class model, posterior class probabilities were calculated for each participant in the sample (Asparouhov & Muthén, 2014), then each participant was assigned to the latent class with the highest posterior probability.

We estimated the unconditional probability of each class and conditional probabilities of reporting each sexual behavior included in the LCA (Table 4). We examined values and patterns of both the unconditional and conditional probabilities to characterize youth in each class and developed a descriptive label for each class (Figure 1).

Predictors of Latent Class Membership

Latent class membership was used to evaluate the association between classes of sexual risk behavior and parental characteristics and risk behaviors. Descriptive statistics were calculated to describe sociodemographic, behavioral risk and parental characteristics of youth in the slums of Kampala by latent class (Table 5). The sociodemographic, behavioral risk and parental covariates were entered into a final multinomial logistic regression model to predict latent class membership adjusted for all other variables (Table 6).

Table 2. Demographic and Psychosocial Characteristics, Risk behavior and Parental Factor among Sexually Active Youth Living in the Slums of Kampala, 2014 (n=593)

Characteristics	**n**	**(%)**
Sex		
Male	244	41.2
Female	349	58.9
Age		
12-14	31	5.23
15-16	132	22.3
17-18	430	72.5
Education (7 missing)		
Primary or less	198	33.8
Completed primary	120	20.5
Secondary or higher	268	45.7
Ever Lived on Streets		
Yes	176	29.7
No	417	70.3
Ever had STI		
Yes	312	52.6
No	281	47.4
HIV-positive (7 missing)		
Yes	81	13.82
No	505	86.2
Alcohol Before Sex		
Yes	185	31.2
No	408	68.8
Parental Living Status		
Both parents alive	208	35.1
One parent dead	239	40.3
Both parents dead	146	24.6
Parental Monitoring		
High	132	22.3
Low	461	77.7
Condom Use First Sex		
Yes	262	44.2
No	331	55.8
Condom Use Last Sex		
Yes	391	65.9
No	202	34.1

Condom Use Past 3 Months		
Consistent	145	24.6
Inconsistent	445	75.4
Lifetime sexual partners		
≤2	316	53.4
≥3	276	46.6
Age of Sexual Debut		
<15	247	41.7
≥15	346	58.3
Alcohol Caused No Condom Use Past 12 months		
Yes	172	29.0
No	421	71.0
Alcohol Caused Multiple Partners Past 12 months		
Yes	114	19.2
No	479	80.8
Traded Sex		
Yes	231	38.9
No	362	61.1

Table 3. LCA Model Selection Indices for Latent Class Models with Increasing Number of Classes.

Model	AIC	CAIC	BIC	saBIC	AWE	LRTS	Adj. LMR *p*-value	Entropy
2-class	5571.56	5639.75	5628.75	5604.14	5740.94	387.54	0.000	0.836
3-class	5438.92	**5600.09**	**5552.93**	5470.39	**5839.26**	**159.86**	0.000	0.760
4-class	**5407.43**	5622.96	5560.91	**5449.79**	5944.93	48.64	**0.040**	0.765
5-class	5407.13	5679.89	5600.08	5460.40	6084.65	17.98	0.244	0.751

Note. AIC= Akaike Information Criterion. CAIC= Consistent Akaike's Information Criterion. BIC= Bayesian Information Criterion. saBIC= Sample-Size Adjusted BIC. AWE= Approximate Weight of Evidence Criterion. LRTS= Likelihood Ratio Test Statistic. Adju. LMR= Adjusted Lo-Mendell Rubin Test.

Table 4. Sexual Risk Behavior Latent Class Probabilities and Conditional Probabilities for the Three-class Model among Sexually Active Youth Living in the Slums of Kampala, 2014.

	Overall		3-Class Model (Class 1) High-risk	(Class 2) Medium-risk	(Class 3) Low-risk
	n=593		n=164	n=223	n=206
Unconditional probability of each class			0.28	0.38	0.35
Indicator	n	%	Conditional probability of each indicator		
Condom Use First Sex (No)	331	55.8	0.70	0.77	0.22
Condom Use Last Sex (No)	202	34.1	0.32	0.68	0.00
Consistent condom use past 3 months (No)	445	75.4	0.83	0.96	0.48
Lifetime sexual partners (≥ 3)	276	46.6	0.84	0.37	0.28
Early Sexual Debut (<15 years of age)	247	41.7	0.55	0.46	0.27
Alcohol No Condom Use (yes)	172	29.0	0.90	0.05	0.06
Alcohol Multiple Partners (yes)	114	19.2	0.68	0.01	0.01
Traded Sex (yes)	231	39.0	0.59	0.34	0.29

Figure 1. Sexual Risk Behavior Latent Class Probabilities and Conditional Probabilities for a Three-class Model among Sexually Active Youth Living in the Slums of Kampala.

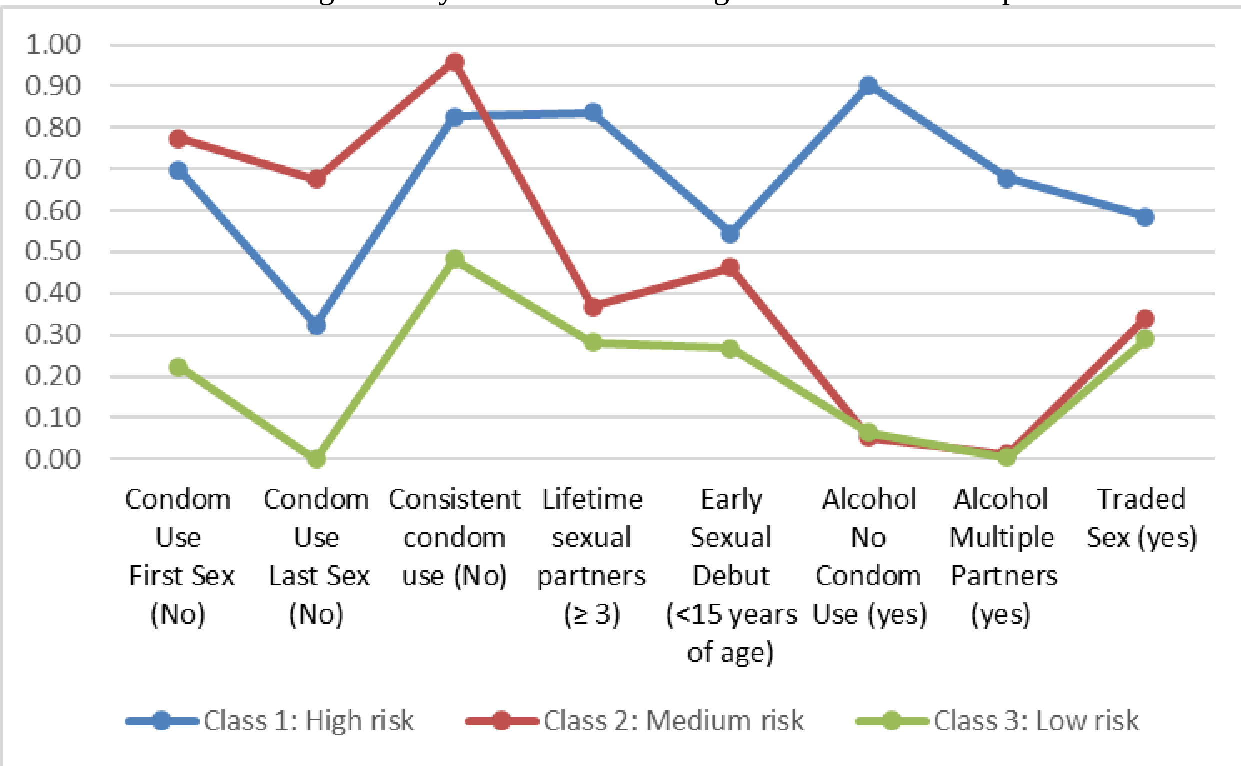

Table 5. Demographic and Psychosocial Characteristics among Youth Living in the Slums of Kampala among Three Latent Classes of Sexual Behaviors (n=593)

	Latent Classes			Total (n=593) 100%	
	(Class 1) High risk 164 (28%)	(Class 2) Medium Risk 223 (38%)	(Class 3) Low risk 206 (35%)		Chi-square p-value
Socio-demographic					
Sex					
Male	61 (37.2)	99 (44.4)	84 (40.8)	244 (41.2)	.36
Female	103 (62.8)	124 (55.6)	122 (59.2)	349 (58.8)	
Age					
12-14 years	4 (2.44)	22 (9.9)	5 (2.43)	31 (5.23)	**.0002**
15-16 years	35 (21.3)	59 (26.5)	38 (18.5)	132 (22.3)	
17-18 years	125 (76.2)	142 (63.7)	163 (79.1)	430 (72.5)	
Education (7 missing)					
Primary or less	65 (40.1)	75 (34.1)	58 (28.4)	198 (33.8)	**.04**
Completed primary	38 (23.5)	44 (20.0)	38 (18.6)	120 (20.5)	
Secondary or higher	59 (36.4)	101 (45.9)	108 (52.9)	268 (45.7)	
Ever Lived on Streets					
Yes	76 (46.3)	61 (27.4)	39 (18.9)	176 (29.7)	**<.0001**
No	88 (53.7)	162 (72.6)	167 (81.1)	417 (70.3)	
Risk Behaviors					
Ever had STI					
Yes	122 (74.4)	109 (48.9)	81 (39.3)	312 (52.6)	**<.0001**
No	42 (25.6)	114 (51.1)	125 (60.7)	281 (47.4)	
HIV-positive (7 missing)					
Yes	35 (21.6)	26 (11.8)	20 (9.9)	81 (13.8)	**.003**
No	127 (78.4)	195 (88.2)	183 (90.2)	505 (86.2)	

Alcohol Before Sex					
Yes	121 (73.8)	36 (16.4)	28 (13.6)	185 (31.2)	**<.0001**
No	43 (26.2)	187 (83.9)	178 (86.4)	408 (68.8)	
Parental Factors					
Parental Living Status					
Both Living	35 (21.3)	92 (41.3)	81 (39.3)	208 (35.1)	**<.0001**
One Living	72 (43.9)	81 (36.3)	86 (41.8)	239 (40.3)	
Both deceased	57 (34.8)	50 (22.4)	39 (18.9)	146 (24.6)	
Parental Monitoring					
High	24 (14.6)	42 (18.8)	66 (32.0)	132 (22.3)	**.0001**
Low	140 (85.4)	181 (81.1)	140 (68.0)	461 (77.7)	

Table 6. Multivariable Associations between Demographic and Psychosocial Characteristics and Sexual Behavior Risk Classes among Youth Living in the Slums of Kampala, (n=579)

	Latent Classes (reference category = Low-risk)	
Variable	High-risk AOR (95% CI)	Medium risk AOR (95% CI)
Sex		
Male	Ref	Ref
Female	0.96 (0.50-1.85)	0.89 (0.52-1.53)
Age	1.06 (0.63-1.80)	**0.56 (0.38-0.83)**
Education		
Primary or less	Ref	Ref
Completed primary	0.79 (0.29-2.13)	0.54 (0.22-1.29)
Secondary or higher	0.61 (0.30-1.24)	0.87 (0.49-1.55)
Ever Lived on Streets		
Yes	2.38 (0.73-7.81)	1.67 (0.32-8.79)
No	Ref	Ref
Ever had STI		
Yes	**4.49 (1.69-11.90)**	2.03 (0.67-6.12)
No	Ref	Ref
HIV-positive		
Yes	1.93 (0.62-6.01)	1.30 (0.47-3.56)
No	Ref	Ref
Alcohol Before Sex		
Yes	**24.58 (11.60-52.11)**	0.90 (0.37-2.22)
No	Ref	Ref
Parental Living Status		
Both Living	Ref	Ref
One Living	1.30 (0.66-2.55)	**0.58 (0.35-0.97)**
Both deceased	**2.79 (1.18-6.61)**	0.85 (0.40-1.84)
Parental Monitoring		
High	Ref	Ref
Low	1.42 (0.68-2.94)	**2.33 (1.35-4.00)**

4.2 Results

Study population characteristics

The majority of participants were female (58.9%) and 17-18 years of age (72.5%) (Table 2). A third of the sample had less than a primary level education (33.8%) and reported ever living on the streets (29.7%). Over half of the youth reported ever having an STI (52.6%) and 13.8% reported being HIV-positive. About a third of the participants (31.2%) reported that they and/or their partners drink alcohol before sex. The majority of the sample reported not having used a condom at first sex (55.8%), but reported using one at last sex (65.9%). Over a third of the participants (35.8%) reported never using a condom in the past three months, with over 75% reporting inconsistent use. Almost half of the sample reported three or more lifetime sexual partners and over 40% had initiated sex before 15 years of age. Almost a third of the sample reported alcohol-related condom-less sex in the past year and nearly 20% reported that alcohol had caused sexual encounters with multiple partners. Lastly, nearly 40% of the youth had engaged in transactional sex during their lifetimes.

Latent Class Analysis of Sexual Risk Behaviors

After fitting latent class models to the eight observed sexual risk behaviors, the three-class model was selected given that it had the smallest BIC and CAIC values, a lower Adjusted LMR p-value (p=0.000) compared to the four-class model (p=0.040), a relatively high entropy, comparable to the four-class model, and it produced a substantive interpretation of the classes (Table 3).

Of the eight sexual risk indicator behaviors, the most reported sexual risk behaviors were not consistently using a condom in the past three months (75.4%), followed by a majority of the youth not using a condom at first sex (55.8%). Almost half (46.6%) reported having three or more lifetime sexual partners (46.6%), while nearly 40% reported early sexual debut (<15 years of age) and traded/transactional sex. Less common sexual risk behaviors included no condom use at last sex (34.1%), alcohol-related condomless sex (29%) and alcohol-related multiple sexual partners (19.2%) . The posterior class probabilities for the three-class model indicated that 27.7% (n=164) of the youth were in Class 1, 37.6% (n = 223) in Class 2 and 34.7% (n = 206) in Class 3.

Latent class conditional probability values suggest the Class 1 represents youth who have unprotected sex (no condom use at first sex (0.70) and inconsistent condom use (0.83)), multiple sexual partners (0.84), alcohol-related condomless sex and multiple sexual partners (0.90 and 0.68, respectively) and traded sex (0.59) (Figure 1). Youth in Class 2 also engage in condomless sex with almost all reporting inconsistent condom use (0.96) and high probabilities of no condom use at first and last sex ((0.77 and 0.68, respectively); however, youth in this class reported nearly no alcohol-related high-risk sex and less likely to engage in multiple sexual partnerships (0.37) or traded sex (0.34). Class 3 represents youth who were more likely to have protected sex with all reporting use of a condom at last sex and not likely to have condom-less first sex. Class 3 youth were not likely to have multiple sexual partners (0.28), early sexual debut (0.27), traded sex (0.29) and nearly none had alcohol-related condom-less and multiple partners. Based on the distinct patterns observed between classes, we labeled Class 1 “high-risk” based on very high probabilities for condomless sex, and highest for multiple sex partners, traded sex and alcohol-related indicators, Class 2 “medium risk” based on very high condomless sex, virtually no alcohol-related risky sex, and values for multiple sexual partners, early sexual debut and traded sex lower than Class 1 and higher than Class 3; and Class 3 “low risk” based on lowest probabilities for unprotected sex multiple sex partners, early sexual debut, and traded sex and nearly no alcohol-related sexual behavior.

Socio-Demographic characteristic differences across latent classes.

Table 5 presents the sociodemographic characteristics of the three latent classes. Nearly two-thirds (62.8%) of the youth in the highest risk class were female and most were 17-18 years of age (76.2%). Nearly 40% of the highest risk class had not completed primary level of education, compared to 34.1% of the medium risk class and 28.4% of the lowest risk class. More than half (52.9%) of the lowest risk class completed a secondary or higher education level, compared to only 36.4% of the highest risk class. Almost half (46.3%) of the highest risk class had ever lived on the streets, while only 18.9% of the lowest class and 27.4% of the medium risk class reported every living on the streets. Females were also the majority of youth in the medium risk class (55.6%) and the lowest risk class (59.2%).

Behavioral Risk and Parental Characteristics Across the Latent Classes

Among the risk behaviors we analyzed and presented in Table 5, the prevalence of ever having an STI varied from almost 75% of the highest risk class to a low of 39% in the lowest risk class, with the medium risk class at a prevalence of almost 50%. Similarly, the highest risk class had the highest prevalence of those reporting HIV-positive status (21.6%), with the lowest risk class reporting a prevalence of 9.9% and the medium risk class at almost 12%. Lastly, nearly 75% of the highest risk class reported an overwhelmingly high prevalence of alcohol use by youth or their partners before sex, compared to only 13.6% of the lowest risk class and 16.4% of the medium risk class.

Among the parental status and monitoring characteristics, youth who reported both parents deceased were primarily in the highest risk class (34.8%), compared to the medium class (22.4%) and lowest risk class (18.9%). The prevalence of youth reporting both parents living was nearly equal in the medium and lowest risk classes (41.3% and 39.3%, respectively) and far lower in the high-risk class (21.3%). Youth in the high-risk class reported the lowest prevalence of high parental monitoring of 14.6%, followed by 18.8% of the medium risk class, with the low-risk class having the highest prevalence of 32%.

Socio-demographic, Behavior Risk and Parental Outcomes

In the multivariable model (Table 6), younger age was significant for the medium risk class only (AOR=0.56, 95% CI: 0.38-0.83). Ever having an STI was strongly associated with the high-risk class only (AOR=4.49, 1.69-11.90). Youth in the high-risk group had four and a half times the odds of ever having an STI compared with the youth in the low-risk class. Using alcohol before sex had an enormous impact on membership in the high-risk class, with the odds of youth reporting drinking alcohol before sex nearly 25 times that of the low-risk class (AOR=24.6, 11.6-52.1).

Parental living status was associated with both high and medium classes. Both parents deceased was significant for the high-risk class (AOR=2.79, 1.18-6.61), but not the medium class and one parent living was significant for the medium risk class (AOR=0.58, 0.35-0.97). The odds of having both parents deceased were nearly three times higher for youth in the high-risk class compared to the low-risk class. Interestingly, the odds of having only one parent alive were lower for the medium risk class. Low parental monitoring was associated with the medium risk class (AOR=2.33, 1.35-4.00), but not the high-risk class, compared to the low-risk class.

Youth in the medium risk class had twice the odds of reporting low parental monitoring than the low-risk class.

4.3 **Discussion**

The aims of this study were to identify groups of participants that share similar risk characteristics in their reported sexual behaviors and to determine the correlates of the identified risk classes, including demographic and psychosocial characteristics, risk behaviors and parental living status and monitoring. This study identified three classes of sexual risk behaviors which contributes new research about the numbers and types of classification of sexual risk behavior which extends beyond traditional binary categories of a single sexual risk behavior. Although much research has focused on the risk factors associated with HIV among adults and youth, few have examined patterns or classes of sexual behavior (Noor et al., 2014). To our knowledge, this is the first study to examine the classes of sexual behavior that could describe the heterogeneity of these youth in the slums of Kampala.

The findings show that there are demographic, behavioral risk and parental characteristic differences among the youth from the three distinct sexual risk behavior classes. The three classes differed by age, education, and history of homelessness. Consistent with literature, the high-risk class had the highest proportion of youth with the lowest level of education, while the low-risk class reported the highest level of education (Kamndaya et al., 2014). Young people in sub-Saharan Africa are particularly vulnerable to HIV infection due to lack of education about HIV and lack of parental influence and communication about sexuality (Tarkang et al., 2019). Parental communication with their children about sex has been found to increase protective sexual behavior. Similarly, youth in the high-risk class were more than twice as likely to report ever living on the streets. Youth living on the streets lack family structure and face family instability which is associated with risky behavior and substance use (Carlson, 2006; Musick & Meier, 2010; Self-Brown et al., 2018; Swahn, Culbreth, Staton, & Kasirye, 2017). We did not find any gender differences among the classes, contrary to some previous studies of youth in sub-Saharan Africa (Amo-Adjei & Tuoyire, 2018; Doyle et al., 2012). However, gender differences in protective sexual behavior of youth in Africa remain unclear and understudied (Ajayi & Okeke, 2019). We found no differences among the three classes of risk, filling the gap in understanding whether gender plays a role in protective or high-risk sexual behavior.

The findings show that membership in sexual risk classes have different behavioral and parental characteristics, which is important for HIV prevention and adolescent reproductive health programs. Youth in the high-risk class had nearly five times the odds of ever having an STI compared to the low-risk class. This is of concern as the presence of certain STIs such as HSV-2 and syphilis may increase the risk of HIV acquisition (Chun et al., 2013). Previous research in this population of youth reported an extremely high prevalence (71.6%) of co-infection among those with HIV (Culbreth et al., 2020). In addition, the high-risk class reported high levels of alcohol-related high-risk sexual behavior and low condom use, which are drivers for STIs.

Similarly, the proportion of those reporting to be HIV positive from high-risk class was twice as high as that of the low-risk class and the medium risk class; however, the association between HIV-positive status as a risk factor and the high-risk class was not significant in the multivariable model after controlling for the other factors. These findings are surprising given the sexual risk behavior profile of the high-risk class based on the eight observed variables. However, this study did not assess how HIV was acquired in these youth, with the possibility that mother-to-child transmission is the primary explanation for higher HIV prevalence among the high-risk class rather than through sexual risk behaviors. These findings and the possibility of mother-to-child transmission have important policy implications and highlight the importance of reduction of sexual risk behaviors in HIV-positive youth to prevent the spread of HIV to their partners.

The greatest disparity among the three classes was using alcohol before sex, where nearly three-quarters of the high-risk class engaged in such behavior, nearly five times that of the low-risk class and the medium class. The association between using alcohol before sex and the high-risk class was of great and concerning magnitude. The high-risk class represented nearly a third of the sample who had alcohol-related risky sexual behavior, high levels of unprotected sex, multiple sexual partners, traded sex and early sexual debut. Although the high-risk class had high levels of risky behavior across the spectrum, the driver of membership in this class compared to medium and low-risk appears to be alcohol-related condomless sex and multiple partners. This is consistent with the literature that alcohol use has been shown to be associated with risky sexual behaviors, HIV and STIs among youth in sub-Saharan Africa and slum youth in Kampala (Ariza-Mejia et al., 2013; Kalichman et al., 2010; Kalichman et al., 2007; Swahn et al., 2019; Tumwesigye et al., 2012; Wandera et al., 2015). Alcohol use is known to impair judgment and affect inhibitions, leading to high-risk sexual behaviors such as condomless sex and sex with multiple partners (Kumar et al., 2020). Previous research has shown that nearly a third of these youth have reported drunkenness (Swahn, Gressard, et al., 2012) and that the HIV epidemic is fueled by alcohol use and alcohol-related sexual behaviors, even with consumption in smaller amounts (Kalichman et al., 2007; Swahn et al., 2019). As previous studies have suggested, the current findings highlight the need for examination of the environmental context where alcohol is obtained and consumed before sexual activity (Scribner et al., 2010). The high-risk class included nearly double the proportion of youth who had ever lived on the streets than the medium and low classes. Future studies should focus on informing structural interventions to address underage drinking, alcohol marketing and access to alcohol by these vulnerable youth. In addition, the findings are a call to improve prevention strategies to target alcohol use as a potential risk factor STI and HIV.

The findings also show that membership in sexual risk behavior classes have different parental characteristics. The proportion of youth in the high-risk class reporting both parents deceased was nearly twice that of the low-risk class and was also significant in the multivariable analyses for high-risk versus low-risk class. Such findings are consistent with previous studies examining orphan status (Swahn, Culbreth, Staton, & Kasirye, 2017) and family instability (Self-Brown et al., 2018) and their influence on sexual risk behaviors.

In addition, those with one parent living were less likely to be in the medium-risk class than the low-risk class, highlighting a critical finding that having at least one living parent may be protective in sexual risk behavior. This finding is consistent with previous studies providing evidence that adolescents are more likely to have protected sex when parents, especially the mother, know what they are doing (Bankole, Ahmed, et al., 2007; Bankole, Biddlecom, et al., 2007; Dietrich et al., 2013). However, the lack of association between one parent living and the high-risk class was unexpected given previous studies show greater risk-taking behavior from youth from single parent families (Carlson, 2006; Musick & Meier, 2010). We found parental monitoring similar for the high-risk and medium-risk classes. Both reported very high proportions of low parental monitoring compared to the low-risk group. However, in the multivariable analysis, we only found a significant association in low parental monitoring between the medium and low-risk classes. Such association was not significant for the high-risk class compared to the low-risk class. This finding was unexpected and in contrast to the literature supporting the hypothesis that high parental monitoring would be associated with protective, low-risk sexual behavior (Pilgrim et al., 2014). These findings shed new light on the role of parental influence on risk behavior among these youth in the slums. Future studies should examine the complexity of the family structure and living arrangements in addition to relationship dynamics in order to tailor HIV prevention programs offered to these youth. Given the high levels of unprotected sex and alcohol-related high-risk sexual behavior, increasing the protective role in parents and family may offer an upstream, primary prevention to achieve this goal.

Despite strengths of this study, it was subject to several important limitations. First, the study utilized a cross-sectional convenience sample. However, this population is difficult to reach and is understudied; therefore, the collection of this data provides an invaluable insight to this population. Because of the cross-sectional design, this study did not assess temporality and cannot infer causality. Sensitive topics were used in the questionnaire, and misclassification may be present and have likely produced an underestimate of the overall and true prevalence of risky behaviors in the population. Self-reporting over the past time periods is subject to recall and social desirability bias. Second, the survey questions regarding parent and family role and structure were not exhaustive. Future surveys should include additional questions about the residential family structure and living arrangements of the youth. Future studies are needed for a longitudinal analysis of risk behaviors and HIV and the role of parental and family structure and influence on HIV incidence. Lastly, longitudinal studies of early adolescence are needed to determine how HIV-positive status affects sexual risk behaviors and its role as a driver of the HIV epidemic.

Utilizing latent class analysis to classify sexual risk behaviors and examine their association with different risk behaviors and parental factors is critical to tailoring the public health programs offered to these youth who are a vulnerable risk group for HIV (Tarkang et al., 2019). Findings from this study highlight the importance of examining sexual risk behaviors with a multilayered approach to address the patterns of high-risk and protective behavior. High levels of STIs and alcohol use before sex and having no parents were associated with membership in the high-risk group and those who reported low parental monitoring had more than twice the odds of being in the medium-risk group. Based on these findings, multi-level programs are critical to promote low-risk, protective sexual behavior among these adolescents empowering parents and other family members in health promotion and communication on sexuality. Future research should focus on examining the role of engagement and pathways of influence of parents and family among this sample of service-seeking youth in promoting health promoting behavior.

References

Adepoju, A., & Mbunga, W. (1997). *The African family: an overview of changing forms*. Zed Books.

Ajayi, A. I., Ismail, K. O., & Akpan, W. (2019, Sep). Factors associated with consistent condom use: a cross-sectional survey of two Nigerian universities. *BMC public health, 19*(1), 1207. https://doi.org/10.1186/s12889-019-7543-1

Ajayi, A. I., & Okeke, S. R. (2019, Jul 23). Protective sexual behaviours among young adults in Nigeria: influence of family support and living with both parents. *BMC public health, 19*(1), 983. https://doi.org/10.1186/s12889-019-7310-3

Ajayi, A. I., & Olamijuwon, E. O. (2019). What predicts self-efficacy? Understanding the role of sociodemographic, behavioural and parental factors on condom use self-efficacy among university students in Nigeria. *PLoS One, 14*(8), e0221804. https://doi.org/10.1371/journal.pone.0221804

Amo-Adjei, J., & Tuoyire, D. A. (2018, Mar). Timing of Sexual Debut among Unmarried Youths Aged 15-24 Years in Sub-Saharan Africa. *J Biosoc Sci, 50*(2), 161-177. https://doi.org/10.1017/S0021932017000098

Ariza-Mejia, M., Garcia-Garcia, L., Puerta-Lopez, T., Menendez-Prieto, B., Vera-Garcia, M., Clavo-Escribano, P., Ballesteros, M., Rodriguez-Martin, C., Gil, d. M., & Romero-Guerrero, J. d. (2013). Risk factors of HIV Co-infection and sexual behaviours in patients with gonococcal infection in a STI's clinic in Madrid. *Journal of AIDS and Clinical Research, 4*(9).

Asparouhov, T., & Muthén, B. (2014). Auxiliary variables in mixture modeling: Three-step approaches using M plus. *Structural Equation Modeling: A Multidisciplinary Journal, 21*(3), 329-341.

Asparouhov, T., & Muthén, B. (2018). Variable-Specific Entropy Contribution.

Baliunas, D., Rehm, J., Irving, H., & Shuper, P. (2010). Alcohol consumption and risk of incident human immunodeficiency virus infection: a meta-analysis. *International journal of public health, 55*(3), 159-166.

Bankole, A., Ahmed, F. H., Neema, S., Ouedraogo, C., & Konyani, S. (2007, Dec). Knowledge of correct condom use and consistency of use among adolescents in four countries in sub-

Saharan Africa. *Afr J Reprod Health, 11*(3), 197-220. https://www.ncbi.nlm.nih.gov/pubmed/18458741

Bankole, A., Biddlecom, A., Guiella, G., Singh, S., & Zulu, E. (2007, Dec). Sexual behavior, knowledge and information sources of very young adolescents in four sub-Saharan African countries. *Afr J Reprod Health, 11*(3), 28-43. https://www.ncbi.nlm.nih.gov/pubmed/18458739

Blum, R. W. (2007, Sep). Youth in sub-Saharan Africa. *J Adolesc Health, 41*(3), 230-238. https://doi.org/10.1016/j.jadohealth.2007.04.005

Bronfenbrenner, U. (1979). *The ecology of human development*. Harvard university press.

Bronfenbrenner, U. (1992). *Ecological systems theory*. Jessica Kingsley Publishers.

Carlson, B. E. (2006). Best practices in the treatment of substance-abusing women in the child welfare system. *Journal of Social Work Practice in the Addictions, 6*(3), 97-115.

Cecil, H., Pinkerton, S. D., Bogart, L. M., Pavlovic, J., & Kimball, A. M. (2005, Nov). An empirical study of ordinal condom use measures. *J Sex Res, 42*(4), 353-358. https://doi.org/10.1080/00224490509552291

Cederbaum, J. A., Gilreath, T. D., & Barman-Adhikari, A. (2014, Dec). Perceived risk and condom use among adolescents in sub-Saharan Africa: a latent class analysis. *Afr J Reprod Health, 18*(4), 26-33. https://www.ncbi.nlm.nih.gov/pubmed/25854090

Chen, L., Jha, P., Stirling, B., Sgaier, S. K., Daid, T., Kaul, R., Nagelkerke, N., & International Studies of, H. I. V. A. I. (2007, Oct 3). Sexual risk factors for HIV infection in early and advanced HIV epidemics in sub-Saharan Africa: systematic overview of 68 epidemiological studies. *PLoS One, 2*(10), e1001. https://doi.org/10.1371/journal.pone.0001001

Chun, H. M., Carpenter, R. J., Macalino, G. E., & Crum-Cianflone, N. F. (2013). The role of sexually transmitted infections in HIV-1 progression: a comprehensive review of the literature. *Journal of sexually transmitted diseases, 2013*.

Coates, T. J., Richter, L., & Caceres, C. (2008, Aug 23). Behavioural strategies to reduce HIV transmission: how to make them work better. *Lancet, 372*(9639), 669-684. https://doi.org/10.1016/S0140-6736(08)60886-7

Coldiron, M. E., Stephenson, R., Chomba, E., Vwalika, C., Karita, E., Kayitenkore, K., Tichacek, A., Isanhart, L., Allen, S., & Haworth, A. (2008, Jul). The relationship between alcohol consumption and unprotected sex among known HIV-discordant couples in Rwanda and Zambia. *AIDS Behav, 12*(4), 594-603. https://doi.org/10.1007/s10461-007-9304-x

Cort, D. A., & Tu, H. F. (2018, Jan). Safety in stigmatizing? Instrumental stigma beliefs and protective sexual behavior in Sub-Saharan Africa. *Soc Sci Med, 197*, 144-152. https://doi.org/10.1016/j.socscimed.2017.12.007

Cowan, F., & Pettifor, A. (2009, Jul). HIV in adolescents in sub-Saharan Africa. *Curr Opin HIV AIDS, 4*(4), 288-293. https://doi.org/10.1097/COH.0b013e32832c7d10

Crosby, R. A., DiClemente, R. J., Wingood, G. M., Lang, D., & Harrington, K. F. (2003, Jun). Value of consistent condom use: a study of sexually transmitted disease prevention among African American adolescent females. *Am J Public Health, 93*(6), 901-902. https://doi.org/10.2105/ajph.93.6.901

Culbreth, R., Swahn, M. H., Ndetei, D., Ametewee, L., & Kasirye, R. (2018). Suicidal ideation among youth living in the slums of Kampala, Uganda. *International Journal of Environmental Research and Public Health, 15*(2), 298.

Culbreth, R., Swahn, M. H., Salazar, L. F., Ametewee, L. A., & Kasirye, R. (2020). Risk factors associated with HIV, sexually transmitted infections (STI), and HIV/STI co-infection among youth living in the slums of Kampala, Uganda. *AIDS and Behavior, 24*(4), 1023-1031.

Davis, E. C., & Friel, L. V. (2001). Adolescent sexuality: Disentangling the effects of family structure and family context. *Journal of marriage and family, 63*(3), 669-681.

Defo, B. K., & Dimbuene, Z. (2012). Influences of family structure dynamics on sexual debut in Africa: implications for research, practice and policies in reproductive health and social development. *African journal of reproductive health, 16*(2), 147-172.

DiClemente, R. J., & Crosby, R. A. (2009, Feb). Preventing HIV among adolescents in Sub-Saharan Africa. *J Adolesc Health, 44*(2), 101-102. https://doi.org/10.1016/j.jadohealth.2008.12.001

Dietrich, J., Sikkema, K., Otwombe, K. N., Sanchez, A., Nkala, B., de Bruyn, G., Van Der Watt, M., & Gray, G. E. (2013, Jul 1). Multiple levels of influence in predicting sexual activity and condom use among adolescents in Soweto, Johannesburg, South Africa. *J HIV AIDS Soc Serv, 12*(3-4), 404-423. https://doi.org/10.1080/15381501.2013.819312

Doyle, A. M., Mavedzenge, S. N., Plummer, M. L., & Ross, D. A. (2012, Jul). The sexual behaviour of adolescents in sub-Saharan Africa: patterns and trends from national surveys. *Trop Med Int Health*, *17*(7), 796-807. https://doi.org/10.1111/j.1365-3156.2012.03005.x

Espada, J. P., Morales, A., Guillén-Riquelme, A., Ballester, R., & Orgilés, M. (2016, 2016/01/14). Predicting condom use in adolescents: a test of three socio-cognitive models using a structural equation modeling approach. *BMC public health*, *16*(1), 35. https://doi.org/10.1186/s12889-016-2702-0

Fatusi, A., & Wang, W. (2009, Apr). Multiple sexual partnership mediates the association between early sexual debut and sexually transmitted infection among adolescent and young adult males in Nigeria. *Eur J Contracept Reprod Health Care, 14*(2), 134-143. https://doi.org/10.1080/13625180802601110

Fisher, J. C. (2010, 2010/06/01). Can we engage the alcohol industry to help combat sexually transmitted disease? *International journal of public health, 55*(3), 147-148. https://doi.org/10.1007/s00038-010-0142-7

Ghebremichael, M., Larsen, U., & Paintsil, E. (2009, Sep). Association of age at first sex with HIV-1, HSV-2, and other sexual transmitted infections among women in northern Tanzania. *Sex Transm Dis, 36*(9), 570-576. https://doi.org/10.1097/OLQ.0b013e3181a866b8

Grabowski, M. K., Serwadda, D. M., Gray, R. H., Nakigozi, G., Kigozi, G., Kagaayi, J., Ssekubugu, R., Nalugoda, F., Lessler, J., Lutalo, T., Galiwango, R. M., Makumbi, F., Kong, X., Kabatesi, D., Alamo, S. T., Wiersma, S., Sewankambo, N. K., Tobian, A. A. R., Laeyendecker, O., Quinn, T. C., Reynolds, S. J., Wawer, M. J., Chang, L. W., & Rakai Health Sciences, P. (2017, Nov 30). HIV Prevention Efforts and Incidence of HIV in Uganda. *N Engl J Med, 377*(22), 2154-2166. https://doi.org/10.1056/NEJMoa1702150

Greif, M. J. (2012, Mar). Housing, medical, and food deprivation in poor urban contexts: implications for multiple sexual partnerships and transactional sex in Nairobi's slums. *Health Place, 18*(2), 400-407. https://doi.org/10.1016/j.healthplace.2011.12.008

Greif, M. J., Dodoo, F. N., & Jayaraman, A. (2011). Urbanisation, poverty and sexual behaviour: the tale of five African cities. *Urban Stud, 48*(5), 947-957. https://doi.org/10.1177/0042098010368575

Hagenaars, J. A., & McCutcheon, A. L. (2002). *Applied latent class analysis*. Cambridge University Press.

Heeren, G. A., Jemmott III, J. B., Mandeya, A., & Tyler, J. C. (2007). Theory–based predictors of condom use among university students in the United States and South Africa. *AIDS Education & Prevention, 19*(1), 1-12.

Hunsmann, M. (2012). Limits to evidence-based health policymaking: policy hurdles to structural HIV prevention in Tanzania. *Social science & medicine, 74*(10), 1477-1485.

Jama Shai, N., Jewkes, R., Levin, J., Dunkle, K., & Nduna, M. (2010, Nov). Factors associated with consistent condom use among rural young women in South Africa. *AIDS care, 22*(11), 1379-1385. https://doi.org/10.1080/09540121003758465

Kabiru, C. W., Mojola, S. A., Beguy, D., & Okigbo, C. (2013, Mar 1). Growing up at the 'margins': Concerns, aspirations, and expectations of young people living in Nairobi's slums. *J Res Adolesc*, *23*(1), 81-94. https://doi.org/10.1111/j.1532-7795.2012.00797.x

Kalichman, S. C., Eaton, L., & Cherry, C. (2010, Sep). Sexually transmitted infections and infectiousness beliefs among people living with HIV/AIDS: implications for HIV treatment as prevention. *HIV Med, 11*(8), 502-509. https://doi.org/10.1111/j.1468-1293.2009.00818.x

Kalichman, S. C., Simbayi, L. C., Kaufman, M., Cain, D., & Jooste, S. (2007). Alcohol use and sexual risks for HIV/AIDS in sub-Saharan Africa: systematic review of empirical findings. *Prevention science, 8*(2), 141.

Kamndaya, M., Kazembe, L. N., Vearey, J., Kabiru, C. W., & Thomas, L. (2015, May). Material deprivation and unemployment affect coercive sex among young people in the urban slums of Blantyre, Malawi: A multi-level approach. *Health Place, 33*, 90-100. https://doi.org/10.1016/j.healthplace.2015.03.001

Kamndaya, M., Thomas, L., Vearey, J., Sartorius, B., & Kazembe, L. (2014, Jun). Material deprivation affects high sexual risk behavior among young people in urban slums, South Africa. *J Urban Health, 91*(3), 581-591. https://doi.org/10.1007/s11524-013-9856-1

Kamndaya, M., Vearey, J., Thomas, L., Kabiru, C. W., & Kazembe, L. N. (2016, Mar). The role of material deprivation and consumerism in the decisions to engage in transactional sex among young people in the urban slums of Blantyre, Malawi. *Glob Public Health, 11*(3), 295-308. https://doi.org/10.1080/17441692.2015.1014393

Kawai, K., Kaaya, S. F., Kajula, L., Mbwambo, J., Kilonzo, G. P., & Fawzi, W. W. (2008, Nov). Parents' and teachers' communication about HIV and sex in relation to the timing of sexual initiation among young adolescents in Tanzania. *Scand J Public Health, 36*(8), 879-888. https://doi.org/10.1177/1403494808094243

Kumar, S., Culbreth, R. E., Swahn, M. H., & Kasirye, R. (2020). Examining correlates of alcohol related condom-less sex among youth living in the slums of Kampala, Uganda. *AIDS care, 32*(10), 1246-1250.

Latkin, C. A., German, D., Vlahov, D., & Galea, S. (2013). Neighborhoods and HIV: a social ecological approach to prevention and care. *American Psychologist, 68*(4), 210.

le Roux, J., & Smith, C. S. (1998, Fall). Causes and characteristics of the street child phenomenon: a global perspective. *Adolescence, 33*(131), 683-688. https://www.ncbi.nlm.nih.gov/pubmed/9831885

Lyons, M., Swahn, M. H., Whitaker, D., Brown, J. R., Kasper, J., & Culbreth, R. (2017). Associations of lifetime prevalence of homelessness with risky sex, sexual victimization, depressive symptoms, and suicidality among youth in Kampala, Uganda. *International Social Work*, 0020872819847753.

Mackesy-Amiti, M. E., Boodram, B., Handanagic, S., Paz-Bailey, G., Prachand, N. G., Broz, D., & Group, N. S. (2018, Nov 1). Latent Classes of Sexual Risk Behavior and Engagement in Outreach, Intervention and Prevention Services Among Women Who Inject Drugs Across 20 US Cities. *J Acquir Immune Defic Syndr, 79*(3), 305-314. https://doi.org/10.1097/QAI.0000000000001816

Madise, N. J., Ziraba, A. K., Inungu, J., Khamadi, S. A., Ezeh, A., Zulu, E. M., Kebaso, J., Okoth, V., & Mwau, M. (2012, Sep). Are slum dwellers at heightened risk of HIV infection than other urban residents? Evidence from population-based HIV prevalence surveys in Kenya. *Health Place, 18*(5), 1144-1152. https://doi.org/10.1016/j.healthplace.2012.04.003

Magadi, M. A. (2013, Jun). The disproportionate high risk of HIV infection among the urban poor in sub-Saharan Africa. *AIDS Behav, 17*(5), 1645-1654. https://doi.org/10.1007/s10461-012-0217-y

Magni, S., Christofides, N., Johnson, S., & Weiner, R. (2015). Alcohol Use and Transactional Sex among Women in South Africa: Results from a Nationally Representative Survey. *PLoS One, 10*(12), e0145326. https://doi.org/10.1371/journal.pone.0145326

Mbonye, M., Rutakumwa, R., Weiss, H., & Seeley, J. (2014). Alcohol consumption and high risk sexual behaviour among female sex workers in Uganda. *Afr J AIDS Res*, *13*(2), 145-151. https://doi.org/10.2989/16085906.2014.927779

Mehra, D., Ostergren, P. O., Ekman, B., & Agardh, A. (2014). Inconsistent condom use among Ugandan university students from a gender perspective: a cross-sectional study. *Glob Health Action, 7*, 22942. https://doi.org/10.3402/gha.v7.22942

Mimiaga, M. J., Closson, E. F., Safren, S. A., Mabude, Z., Mosery, N., Taylor, S. W., Perez-Brumer, A., Matthews, L. T., Psaros, C., Harrison, A., Grelotti, D. J., Bangsberg, D. R., & Smit, J. A. (2015, Feb). Inkwari: an emerging high-risk place potentiating hiv spread among young adults in a hyper-endemic South African setting. *Arch Sex Behav*, *44*(2), 307-315. https://doi.org/10.1007/s10508-014-0330-2

Ministry of Health. (2017). *Adolescent Health Risk Behaviors in Uganda: A National Cross Sectional Study 2017*. M. o. Health. http://library.health.go.ug/publications/adolescent-health/adolescent-health-risk-behaviors-uganda-national-cross-sectional

Mirembe, R., & Davies, L. (2001). Is schooling a risk? Gender, power relations, and school culture in Uganda. *Gender and education, 13*(4), 401-416.

Muchiri, E., Odimegwu, C., Banda, P., Ntoimo, L., & Adedini, S. (2017, Jul). Ecological correlates of multiple sexual partnerships among adolescents and young adults in urban Cape Town: a cumulative risk factor approach. *Afr J AIDS Res, 16*(2), 119-128. https://doi.org/10.2989/16085906.2017.1318762

Mufune, P. (2000). Street youth in southern Africa. *International Social Science Journal*, *52*(164), 233-243.

Mufune, P. (2015). Poverty and HIV/AIDS in Africa: Specifying the connections. *Social Theory & Health*, *13*(1), 1-29.

Musick, K., & Meier, A. (2010, Sep). Are both parents always better than one? Parental conflict and young adult well-being. *Soc Sci Res, 39*(5), 814-830. https://doi.org/10.1016/j.ssresearch.2010.03.002

Muthén, L., & Muthén, B. (2017). Mplus (Version 8)[computer software].(1998–2017).

Neema, S., Musisi, N., & Kibombo, R. (2004). Adolescent Sexual and Reproductive Health in Uganda: A Synthesis of Research Evidence. https://www.guttmacher.org/sites/default/files/pdfs/pubs/2004/12/20/or14.pdf?q=uganda

Noor, S. W., Ross, M. W., Lai, D., & Risser, J. M. (2014, Apr). Use of latent class analysis approach to describe drug and sexual HIV risk patterns among injection drug users in Houston, Texas. *AIDS Behav, 18 Suppl 3*, 276-283. https://doi.org/10.1007/s10461-014-0713-3

Odimegwu, C., Somefun, O. D., & Chisumpa, V. H. (2019, Mar). Regional Differences in Positive Sexual Behaviour among Youth in Sub-Saharan Africa. *J Biosoc Sci, 51*(2), 254-272. https://doi.org/10.1017/S002193201800010X

Onoya, D., Zuma, K., Zungu, N., Shisana, O., & Mehlomakhulu, V. (2015, Mar). Determinants of multiple sexual partnerships in South Africa. *J Public Health (Oxf), 37*(1), 97-106. https://doi.org/10.1093/pubmed/fdu010

Parkhurst, J. O. (2014). Structural approaches for prevention of sexually transmitted HIV in general populations: definitions and an operational approach. *J Int AIDS Soc, 17*, 19052. https://doi.org/10.7448/IAS.17.1.19052

Peltzer, K. (2010, Aug). Early sexual debut and associated factors among in-school adolescents in eight African countries. *Acta Paediatr, 99*(8), 1242-1247. https://doi.org/10.1111/j.1651-2227.2010.01874.x

Perry, E. W., Culbreth, R., Swahn, M., Kasirye, R., & Self-Brown, S. (2020). Psychological distress among orphaned youth and youth reporting sexual exploitation in Kampala, Uganda. *Children and Youth Services Review, 119*, 105587.

Pettifor, A., O'Brien, K., Macphail, C., Miller, W. C., & Rees, H. (2009, Jun). Early coital debut and associated HIV risk factors among young women and men in South Africa. *Int Perspect Sex Reprod Health, 35*(2), 82-90. https://doi.org/10.1363/ifpp.35.082.09

Pettifor, A. E., Rees, H. V., Kleinschmidt, I., Steffenson, A. E., MacPhail, C., Hlongwa-Madikizela, L., Vermaak, K., & Padian, N. S. (2005, Sep 23). Young people's sexual health in South Africa: HIV prevalence and sexual behaviors from a nationally representative household survey. *AIDS, 19*(14), 1525-1534. https://doi.org/10.1097/01.aids.0000183129.16830.06

Pettifor, A. E., van der Straten, A., Dunbar, M. S., Shiboski, S. C., & Padian, N. S. (2004, Jul 2). Early age of first sex: a risk factor for HIV infection among women in Zimbabwe. *AIDS, 18*(10), 1435-1442. https://doi.org/10.1097/01.aids.0000131338.61042.b8

Pilgrim, N. A., Ahmed, S., Gray, R. H., Sekasanvu, J., Lutalo, T., Nalugoda, F., Serwadda, D., & Wawer, M. J. (2014, Jul 1). Family structure effects on early sexual debut among adolescent girls in Rakai, Uganda. *Vulnerable Child Youth Stud, 9*(3), 193-205. https://doi.org/10.1080/17450128.2013.842027

Pilgrim, N. A., Ahmed, S., Gray, R. H., Sekasanvu, J., Lutalo, T., Nalugoda, F., Serwadda, D., & Wawer, M. J. (2015, Aug). Multiple sexual partnerships among female adolescents in rural Uganda: the effects of family structure and school attendance. *Int J Adolesc Med Health, 27*(3), 319-328. https://doi.org/10.1515/ijamh-2014-0032

Renzaho, A. M., Kamara, J. K., Georgeou, N., & Kamanga, G. (2017). Sexual, Reproductive Health Needs, and Rights of Young People in Slum Areas of Kampala, Uganda: A Cross Sectional Study. *PLoS One, 12*(1), e0169721. https://doi.org/10.1371/journal.pone.0169721

Reynolds, H. W., Luseno, W. K., & Speizer, I. S. (2013). Consistent condom use among men with non-marital partners in four sub-Saharan African countries. *AIDS care, 25*(5), 592-600. https://doi.org/10.1080/09540121.2012.726340

Santelli, J. S., Brener, N. D., Lowry, R., Bhatt, A., & Zabin, L. S. (1998, Nov-Dec). Multiple sexual partners among U.S. adolescents and young adults. *Fam Plann Perspect, 30*(6), 271-275. https://www.ncbi.nlm.nih.gov/pubmed/9859017

Santelli, J. S., DiClemente, R. J., Miller, K. S., & Kirby, D. (1999, Feb). Sexually transmitted diseases, unintended pregnancy, and adolescent health promotion. *Adolesc Med, 10*(1), 87-108, vi. https://www.ncbi.nlm.nih.gov/pubmed/10086168

Santelli, J. S., Edelstein, Z. R., Mathur, S., Wei, Y., Zhang, W., Orr, M. G., Higgins, J. A., Nalugoda, F., Gray, R. H., Wawer, M. J., & Serwadda, D. M. (2013, Jul 1). Behavioral, biological, and demographic risk and protective factors for new HIV infections among youth in Rakai, Uganda. *J Acquir Immune Defic Syndr, 63*(3), 393-400. https://doi.org/10.1097/QAI.0b013e3182926795

Sclar, E. D., Garau, P., & Carolini, G. (2005, Mar 5-11). The 21st century health challenge of slums and cities. *Lancet, 365*(9462), 901-903. https://doi.org/10.1016/S0140-6736(05)71049-7

Scribner, R., Theall, K. P., Simonsen, N., & Robinson, W. (2010). HIV risk and the alcohol environment: advancing an ecological epidemiology for HIV/AIDS. *Alcohol Res Health, 33*(3), 179-183. https://www.ncbi.nlm.nih.gov/pubmed/23584059

Self-Brown, S., Culbreth, R., Wilson, R., Armistead, L., Kasirye, R., & Swahn, M. H. (2018). Individual and parental risk factors for sexual exploitation among high-risk youth in Uganda. *Journal of interpersonal violence*, 0886260518771685.

SHAFII, T., STOVEL, K., DAVIS, R., & HOLMES, K. (2004). Is Condom Use Habit Forming?: Condom Use at Sexual Debut and Subsequent Condom Use. *Sexually transmitted diseases, 31*(6), 366-372. https://journals.lww.com/stdjournal/Fulltext/2004/06000/Is_Condom_Use_Habit_Forming___Condom_Use_at_Sexual.10.aspx

Sherman, S. S., Plitt, S., ul Hassan, S., Cheng, Y., & Zafar, S. T. (2005, Sep). Drug use, street survival, and risk behaviors among street children in Lahore, Pakistan. *J Urban Health, 82*(3 Suppl 4), iv113-124. https://doi.org/10.1093/jurban/jti113

Shrestha, R., Karki, P., & Copenhaver, M. (2016, Feb). Early Sexual Debut: A Risk Factor for STIs/HIV Acquisition Among a Nationally Representative Sample of Adults in Nepal. *J Community Health, 41*(1), 70-77. https://doi.org/10.1007/s10900-015-0065-6

Siziya, S., Muula, A. S., Kazembe, L. N., & Rudatsikira, E. (2008, Feb 11). Harmful lifestyles' clustering among sexually active in-school adolescents in Zambia. *BMC Pediatr, 8*, 6. https://doi.org/10.1186/1471-2431-8-6

Souza, R., Porten, K., Nicholas, S., Grais, R., & Medecins Sans Frontieres-Honduras, t. (2011, Nov). Outcomes for street children and youth under multidisciplinary care in a drop-in centre in Tegucigalpa, Honduras. *Int J Soc Psychiatry, 57*(6), 619-626. https://doi.org/10.1177/0020764010382367

Ssekamatte, T., Tetui, M., Kibira, S. P. S., Isunju, J. B., Mugambe, R. K., Nabiwemba, E., Wafula, S. T., Buregyeya, E., & Bukenya, J. N. (2020). Multiple sexual partnerships and associated factors among young psychoactive-substance-users in informal settlements in Kampala, Uganda. *PLoS One, 15*(10), e0239323. https://doi.org/10.1371/journal.pone.0239323

Stephenson, R. (2009, Jan). Community influences on young people's sexual behavior in 3 African countries. *Am J Public Health, 99*(1), 102-109. https://doi.org/10.2105/AJPH.2007.126904

Swahn, M. H., Braunstein, S., Palmier, J. B., Kasirye, R., & Yao, H. (2014). Disparities in sexual activity indicators among youth living in the slums of Kampala: Comparisons with representative national and urban school-attending youth. *International STD Research & Reviews*, 21-28.

Swahn, M. H., Culbreth, R., Salazar, L. F., Kasirye, R., & Seeley, J. (2016). Prevalence of HIV and Associated Risks of Sex Work among Youth in the Slums of Kampala. *AIDS Res Treat, 2016*, 5360180. https://doi.org/10.1155/2016/5360180

Swahn, M. H., Culbreth, R., Salazar, L. F., Tumwesigye, N. M., Jernigan, D. H., Kasirye, R., & Obot, I. S. (2020). The Prevalence and Context of Alcohol Use, Problem Drinking and Alcohol-Related Harm among Youth Living in the Slums of Kampala, Uganda. *International Journal of Environmental Research and Public Health, 17*(7), 2451.

Swahn, M. H., Culbreth, R., Salazar, L. F., Tumwesigye, N. M., & Kasirye, R. (2019). Psychosocial correlates of self-reported HIV among youth in the slums of Kampala. *BMC public health, 19*(1), 1176.

Swahn, M. H., Culbreth, R., Staton, C. A., & Kasirye, R. (2017). Psychosocial health concerns among service-seeking orphans in the slums of Kampala. *Vulnerable children and youth studies, 12*(3), 258-263.

Swahn, M. H., Culbreth, R., Tumwesigye, N. M., Topalli, V., Wright, E., & Kasirye, R. (2018). Problem drinking, alcohol-related violence, and homelessness among youth living in the slums of Kampala, Uganda. *International Journal of Environmental Research and Public Health, 15*(6), 1061.

Swahn, M. H., Culbreth, R. E., Staton, C. A., Self-Brown, S. R., & Kasirye, R. (2017). Alcohol-related physical abuse of children in the slums of Kampala, Uganda. *International Journal of Environmental Research and Public Health, 14*(10), 1124.

Swahn, M. H., Gressard, L., Palmier, J. B., Kasirye, R., Lynch, C., & Yao, H. (2012). Serious violence victimization and perpetration among youth living in the slums of Kampala, Uganda. *Western journal of emergency medicine, 13*(3), 253.

Swahn, M. H., Palmier, J. B., Kasirye, R., & Yao, H. (2012). Correlates of suicide ideation and attempt among youth living in the slums of Kampala. *International Journal of Environmental Research and Public Health, 9*(2), 596-609.

Tarkang, E., Pencille, L., Amu, H., Komesour, J., & Lutala, P. (2019, Dec). Risky sexual behaviours among young people in sub-Saharan Africa: how can parents use the Ottawa

Charter for Health Promotion for change? *SAHARA J*, *16*(1), 77-80. https://doi.org/10.1080/17290376.2019.1636710

Thomas, L., Vearey, J., & Mahlangu, P. (2011, May 7). Making a difference to health in slums: an HIV and African perspective. *Lancet*, *377*(9777), 1571-1572. https://doi.org/10.1016/S0140-6736(11)60642-9

Toska, E., Pantelic, M., Meinck, F., Keck, K., Haghighat, R., & Cluver, L. (2017). Sex in the shadow of HIV: A systematic review of prevalence, risk factors, and interventions to reduce sexual risk-taking among HIV-positive adolescents and youth in sub-Saharan Africa. *PLoS One*, *12*(6), e0178106. https://doi.org/10.1371/journal.pone.0178106

Tumwesigye, N. M., Wanyenze, R. K., & Greenfield, T. K. (2012). Intoxication before last sexual intercourse and HIV risk behavior among men and women in Uganda: Evidence from a nationwide survey. *The International Journal of Alcohol and Drug Research*, *1*(1).

Tyler, K. A., Gervais, S. J., & Davidson, M. M. (2013). The relationship between victimization and substance use among homeless and runaway female adolescents. *Journal of interpersonal violence, 28*(3), 474-493.

UAC. (2015). *National HIV and AIDS Strategic Plan 2015/2016-2019/2020*. Uganda AIDS Commission, Republic of Uganda. Retrieved January 18, 2021 from https://www.childrenandaids.org/index.php/Uganda_National-HIV-and-AIDS-Strategic-Plan_2015

Uganda Bureau of Statistics - UBOS, & ICF. (2018). *Uganda Demographic and Health Survey 2016*. http://dhsprogram.com/pubs/pdf/FR333/FR333.pdf

Uganda Ministry of Health. (2012). *2011 Uganda AIDS Indicator Survey: Key Findings*. ICF International Retrieved May 7, 2020 from https://health.go.ug/docs/UAIS_2011_REPORT.pdf

Uganda Ministry of Health. (2019). *Uganda population-based HIV impact assessment (UPHIA) 2016–2017*. http://uac.go.ug/sites/default/files/UPHIA%20Final%20Report%20%5B2016%20-%202017%5D.pdf

UNAIDS. (2016). *Prevention Gap Report*. World Health Organization. https://www.unaids.org/sites/default/files/media_asset/2016-prevention-gap-report_en.pdf

UNAIDS. (2019). *AIDSinfo*. https://aidsinfo.unaids.org/

UNAIDS. (2020). *Global AIDS update 2020*. World Health Organization. Retrieved January 25, 2020 from https://www.unaids.org/sites/default/files/media_asset/2020_global-aids-report_en.pdf

United Nations. (2018). *World Urbanization Prospects: The 2018 Revision*. Department of Economic and Social Affairs Population Division. https://population.un.org/wup/Publications/Files/WUP2018-KeyFacts.pdf

United Nations Human Settlements Programme. (2010). *State of the world's cities 2010/2011: Bridging the urban divide*. Earthscan.

Valadez, J. J., Jeffery, C., Davis, R., Ouma, J., Lwanga, S. K., & Moxon, S. (2014). Putting the C back into the ABCs: a multi-year, multi-region investigation of condom use by Ugandan youths 2003-2010. *PLoS One, 9*(4), e93083. https://doi.org/10.1371/journal.pone.0093083

Van Leeuwen, J. M., Sekeramayi, T., Martell, C., Feinberg, M., & Bowersox-Daly, S. (2017). A baseline analysis of the Katanga slums: informing urban public policy in Kampala, Uganda. *African Population Studies, 31*(2).

Wakabi, W. (2008, Feb). Low ART adherence in Africa. *Lancet Infect Dis, 8*(2), 94. https://doi.org/10.1016/s1473-3099(08)70010-0

Wamoyi, J., Ranganathan, M., Kyegombe, N., & Stoebenau, K. (2019, Apr 1). Improving the Measurement of Transactional Sex in Sub-Saharan Africa: A Critical Review. *J Acquir Immune Defic Syndr, 80*(4), 367-374. https://doi.org/10.1097/QAI.0000000000001928

Wamoyi, J., Stobeanau, K., Bobrova, N., Abramsky, T., & Watts, C. (2016). Transactional sex and risk for HIV infection in sub-Saharan Africa: a systematic review and meta-analysis. *J Int AIDS Soc, 19*(1), 20992. https://doi.org/10.7448/IAS.19.1.20992

Wandera, B., Tumwesigye, N. M., Nankabirwa, J. I., Kambugu, A. D., Parkes-Ratanshi, R., Mafigiri, D. K., Kapiga, S., & Sethi, A. K. (2015). Alcohol consumption among HIV-infected persons in a large urban HIV clinic in Kampala Uganda: a constellation of harmful behaviors. *PLoS One, 10*(5), e0126236.

Warren, C. W., Santelli, J. S., Everett, S. A., Kann, L., Collins, J. L., Cassell, C., Morris, L., & Kolbe, L. J. (1998, Jul-Aug). Sexual behavior among U.S. high school students, 1990-

1995. *Fam Plann Perspect*, *30*(4), 170-172, 200. https://www.ncbi.nlm.nih.gov/pubmed/9711454

Weiser, S. D., Leiter, K., Heisler, M., McFarland, W., Percy-de Korte, F., DeMonner, S. M., Tlou, S., Phaladze, N., Iacopino, V., & Bangsberg, D. R. (2006). A population-based study on alcohol and high-risk sexual behaviors in Botswana. *PLoS Med*, *3*(10), e392.

Wilson Chialepeh, N., & Sathiyasusuman, A. (2015). Associated Risk Factors of STIs and Multiple Sexual Relationships among Youths in Malawi. *PLoS One, 10*(8).

World Bank. (2020). *Tackling the Demographic Challenge in Uganda*. World Bank. https://openknowledge.worldbank.org/handle/10986/34676

World Health Organization. (2017). *The importance of sexual and reproductive health and rights to prevent HIV in adolescent girls and young women in eastern and southern Africa*. https://www.who.int/reproductivehealth/publications/linkages/hiv-prevention-adolescent-girls-young-women/en/

World Health Organization. (2021). *Adolescent Health and Development*. https://www.who.int/news-room/q-a-detail/adolescent-health-and-development

Yebra, G., Ragonnet-Cronin, M., Ssemwanga, D., Parry, C. M., Logue, C. H., Cane, P. A., Kaleebu, P., & Brown, A. J. L. (2015). Analysis of the history and spread of HIV-1 in Uganda using phylodynamics. *The Journal of general virology*, *96*(Pt 7), 1890-1898. https://doi.org/10.1099/vir.0.000107

Yode, M., & LeGrand, T. (2012, Jun). Association between age at first sexual relation and some indicators of sexual behaviour among adolescents. *Afr J Reprod Health*, *16*(2), 173-188. https://www.ncbi.nlm.nih.gov/pubmed/22916550

Zulu, E. M., Dodoo, F. N., & Chika-Ezee, A. (2002, Nov). Sexual risk-taking in the slums of Nairobi, Kenya, 1993-8. *Popul Stud (Camb), 56*(3), 311-323. https://doi.org/10.1080/00324720215933

Zuma, K., Setswe, G., Ketye, T., Mzolo, T., Rehle, T., & Mbelle, N. (2010, Jun). Age at sexual debut: a determinant of multiple partnership among South African youth. *Afr J Reprod Health*, *14*(2), 47-54. https://www.ncbi.nlm.nih.gov/pubmed/21243918

Chapter 5.

Conclusions

Globally, HIV remains a critical public health issue with almost 40 million people currently living with HIV worldwide and millions of who have died of AIDS since the start of the epidemic. As HIV affects the health of individuals, it also adversely impacts households, communities, and the development and economic growth and stability of nations. Many of the countries hardest hit by HIV are resource-poor and suffer from other health issues and challenges. In Uganda, HIV prevalence among adults is still high at 6.2%. In Uganda, 60% of the urban population lives in slum dweller communities with the capital city of Kampala home to an estimated 1.7 million people. Lack of basic services in slums negatively affects health and quality of life of slum-dwellers. The rapid growth of urban slums in the region is a cause for concern because of their association with HIV. Data is limited on the health and risk behaviors of adolescents who live in these slums. Studies show that more than 33% of the disease burden and almost 60% of premature death among adults can be associated with behaviors or conditions that began during adolescence and slum youth in Kampala report a high HIV prevalence of 10.2%.   There is limited research on HIV transmission risk and protective factors in sub-Saharan Africa, especially among youth who live on the streets and in the slums who face much of the burden related to poverty, lack of family support as well as infectious and chronic diseases.

A comprehensive examination of the drivers, protective factors and outcomes of high-risk sexual behaviors is critical for program and interventions among vulnerable youth and to complement the biomedical interventions that have greatly reduced the HIV epidemic but have not been able to achieve zero new infections. These three studies seek to address the gaps in the literature regarding HIV-transmission risk and protective sexual behavior among understudied youth across the slums of Kampala by: 1) examining the correlates of consistent condom use among sexually-active slum youth in Kampala, Uganda in order to address and eliminate barriers to condom use in this sub-population of youth; 2) Examining the individual and community-level factors for engaging in multiple sexual partnerships among sexually active slum youth in Kampala, in particular to identify whether slum location is a factor for multiple sexual partnerships. Understanding whether distinct slum communities drive multiple sexual partnerships and other risky sexual behavior is critical in assessing the need for tailored programming for individual youth centers and to determine the need for future studies examining the attributes of each slum community and the structural drivers therein; and 3) A latent class analysis to identify distinct classes of youth based on a set of their sexual risk behaviors, an examination of the role of parental influence on the classes of sexual risk behavior among slum youth in Kampala. This analysis aims to empirically identify risk patterns and determine whether HIV risk varies among this population of Kampala youth.

The first paper examined the correlates of consistent condom use among sexually active youth in the slums of Kampala in order to dissect the barriers to condom use that youth face in the slums. Only consistent condom use offers protection against HIV in the absence of sex with only one uninfected partners. These youth face the challenges of poverty and hardship, the increased likelihood of engaging in risky behaviors and a high prevalence of HIV underscoring of examining the correlates of consistent condom use among these youth. Given that unprotected sex is the primary risk factor for HIV transmission, understanding the modifiable factors of consistent condom use is important to inform and improve HIV prevention programs offer to these youth.

This study found that consistent condom use was low (24.6%) among youth living in the slums of Kampala and that condom use at sexual debut, not drinking alcohol before sex, condom self-efficacy and planning to use condoms were statistically associated with consistent condom use. Additionally, this study found that consistent condom use varied across the slum locations which highlights the need for future research on the drivers of such differences and a closer look at the programs at each center and the neighborhood characteristics where these youth live.

The second paper aimed to examine the individual and community-level factors associated with multiple sexual partnerships among sexually active youth, ages 12-18 years, in the Kampala slums. In addition, this study aimed to examine whether multiple sexual partnerships and other sexual behaviors varied across the slum locations. This study found that almost half of the youth reported having three or more lifetime sexual partners and that early sexual debut, alcohol use in the past year, alcohol use before sex and transactional sex were statistically associated with having three or more lifetime sexual partners. In addition, gender modified the effect of ever living on the streets on having three or more lifetime sexual partners. Having ever lived on the streets was statistically significant for having multiple sexual partnerships only for females. We also found that risk behaviors, including early sexual debut, alcohol use, and transactional sex varied greatly across the slum locations. The youth in Kamwokya reported very high levels of risky behavior and in the multivariable analyses, the odds of youth in Kamwokya reporting three or more sexual partnerships were over twice that of the youth in Bwaise.

The third paper aimed to explore patterns of sexual risk behaviors and to examine risk behavior and parental-related covariates associated with these patterns. The analytic approach used for this study included latent class analysis to identify groups of youth who share similar risk characteristics in their reported sexual behaviors. Three classes of sexual risk behaviors were identified. This study found that using alcohol before sex was highly significant for the high-risk class compared to the low-risk class. Ever having an STI also had a strong association with the high-risk class. Parental living status was also significantly associated with both the high risk and medium risk classes. Youth who had both parents deceased were more likely to be in the high-risk class and those who had only one parent alive were more likely to be in the low-risk class. Parental monitoring was significantly associated with only the medium class. The findings show that membership in sexual risk classes have different behavioral and parental characteristics which is important for focusing HIV prevention programs. Alcohol use before sex and alcohol-related high risk sexual behaviors were drivers of membership in the high-risk class. This study underscores the merit of LCA to empirically identify risk patterns using multiple indicators and our results show HIV risk behaviors vary among these youth in the slums as do their risk behaviors and parental factors. The findings highlight the need for tailored, targeted, multi-level programs to address multiple risk patterns rather than using a silo approach for effective HIV and STI prevention.

Overall, these studies contribute to the dearth of literature on sexual behaviors of youth in the slums in sub-Saharan Africa and Uganda, specifically. The studies also added to the previous studies of these youth living in the slums by examining individual, family and community level factors influencing sexual risk behaviors. Lastly, these studies added to the understanding of patterns of sexual risk behaviors among youth in the slums of Kampala which will help develop more effective programs for HIV prevention.

All three studies highlight the role of alcohol use as a driver for risky sexual behaviors. Given that alcohol use before sex is an important risk factor HIV acquisition, it is imperative to tailor programs to reduce alcohol use by youth to promote protected sex and fewer sexual partners. Examining the classes of sexual behavior elucidated the understanding of patterns of low condom use, many sexual partners and high levels of alcohol-related unprotected sex with multiple partners. In addition, we found that parents have an influence on high risk and protective sexual behavior. Additional research is needed to explore the role of family structure, relationships and monitoring as drivers of sexual risk behavior and overall health promotion of these youth. Lastly, these studies explored the contextual and community level influence on sexual behaviors. Sexual risk and protective behavior varied greatly across the slum locations, highlighting the need for future research to understand neighborhood and youth center characteristics as potential drivers of this heterogeneity and to inform structural interventions to reduce underage and risky alcohol use and increase protective sexual behavior. Further longitudinal research is needed to examine these individual, family and community-level factors and pathways in HIV and STI prevention.