Vulnerability and life style factors among university students in Ethiopia: Assessing risky sexual behavior, exposure to violence and patterns of substance use and alcohol consumption

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Abstract:

Background: University students are at a transitional stage in life characterized by increased independence, autonomous decision-making, reduced parental supervision, and heightened susceptibility to peer pressure. These dynamics expose them to various risks, including risky sexual behaviors, violence, and use of substances and alcohol. These risky behaviors often result in serious negative consequences, such as sexually transmitted infections (STIs) including HIV, unintended pregnancies, unsafe abortions, and psychosocial problems. Despite the significance of these issues, comprehensive studies targeting both male and female university students remain limited in Ethiopia. Therefore, the aim of this thesis was to explore the prevalence of and factors associated with risky sexual behavior, exposure to violence, and patterns of substance and alcohol use among university students in Ethiopia. The findings will inform the development of strategic and targeted interventions aimed at preventing and managing risky sexual behavior, violence exposure, and risky behaviors in the university context.

Methods: All three papers are derived from a cross-sectional study conducted among 2,988 students from six randomly selected universities in Ethiopia. Data were collected using a structured and self-administered questionnaire. For papers I and II, descriptive statistics were used to summarize the data, while bivariable and multivariable logistic regression analyses were conducted to identify factors associated with the outcome variables. For paper III, latent class analysis (LCA) was employed to identify subgroups of students based on their substance and alcohol use behavior, and multinomial logistic regression was used to identify factors associated with class membership.

Results: Paper I revealed that 19.5% of students who had sexual intercourse in the last 12 months engaged in risky sexual behavior (RSB). Of these, 29.9% had multiple sexual partners, and 69.3% did not consistently use condoms with new partners. Older age, early sexual debut, and experiences of emotional violence were significantly associated with RSB. Paper II showed that 17.6% of students reported exposure to any type of violence in the past year (17.9% among males and 16.5% among females). Factors significantly associated with violence exposure included older age, being in a relationship, rural residence, frequent alcohol use, khat chewing, and other drug use in the past 12 months. Paper III identified four distinct substance and alcohol use patterns through LCA: non-users (36.7%), alcohol consumers (29.9%), substance users (22.7%), and both alcohol and substance users (10.8%). Prior residence (urban/rural), average monthly expenditure, and age at sexual debut were significantly associated with class membership.

Conclusion: Risky sexual behavior, exposure to violence, and substance and alcohol use are public health concerns among university students in Ethiopia. These issues are driven by a complex interplay of individual, behavioral, social, and environmental factors. Therefore, it is essential for universities and relevant stakeholders to design and implement targeted interventions aimed at prevention and response to these challenges within the university student population.

Keywords: Risky sexual behavior, violence, substance, alcohol, university students, Ethiopia

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This PhD thesis is dedicated to the memory of my esteemed mother-in-law, Mrs. Tsehay Abebe, a passionate advocate for women's education and empowerment.

Table of Contents

List of original papers

The thesis is based on the following original papers:

1. Belihu WB, Amogne MD, Herder T, Sundewall J, Agardh A.(2024) Risky sexual behavior and associated factors among university students in Ethiopia: a cross-sectional national survey. BMC Public Health; 24(1):1–14. https://doi.org/10.1186/s12889-024-19213-2
2. Belihu WB, Herder T, Amogne MD, Sundewall J, Palmieri J, Agardh A (2025) Exposure to violence and associated factors among university students in Ethiopia: A cross-sectional study. PLoS ONE 20(3): e0319792. https://doi.org/10.1371/journal.pone.0319792
3. Belihu WB, Agardh A, Amogne MD, Sundewall J, Herder T. Patterns of substance use, and alcohol consumption, and their association with risky sexual behaviors among university students in Ethiopia: a latent class analysis (manuscript)

Abstract

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Abbreviations

AIC	Akaike Information Criterion
AIDS	Acquired Immunodeficiency Syndrome
AOR	Adjusted Odds Ratio
BIC	Bayesian Information Criterion
CAIC	Consistent AIC
CI	Confidence Intervals
COR	Crud Odds Ratio
CSE	Comprehensive Sexuality Education
EDHS	Ethiopian Demographic and Health Survey
EPHI	Ethiopian Public Health Institute
HED	Heavy Episodic Drinking
HIV	Human Immunodeficiency Virus
LCA	Latent Class Analysis
GBV	Gender-Based Violence
PLHIV	People Living with HIV
RSB	Risky Sexual Behavior
SABIC	Sample-Size Adjusted BIC
STI	Sexually Transmitted Infection
STD	Sexually Transmitted Disease
WHO	World Health Organization

Introduction

Africa has the world's youngest population, with 70% of sub-Saharan Africa being under 30 years old. This youthful demographic presents a significant opportunity for the continent's growth and development, provided these younger generations are empowered to achieve their full potential. It is crucial to involve young people in decision-making processes and provide them with access to work and opportunities for innovation (1). As of 2023, Ethiopia is the second most populous nation in Africa with about 126.5 million people next to Nigeria (2), and the younger population aged 10-24 accounts for 33% (3).

Higher education in Ethiopia has increasing access and enrollment of students. Its goal is to prepare knowledgeable, skilled, and emotionally mature graduates through demand-based programs, resulting in the country becoming internationally competitive, technologically equipped, and economically self-sufficient (4). To achieve this goal the physical, mental and social well-being of the students must be ensured, particularly their sexual and reproductive health (SRH). To join a university, students must meet specific academic and administrative requirements. Students need to complete 12 years of schooling and obtain a passing grade in the Ethiopian National School Leaving Certificate Examination or Ethiopian Higher Education Entrance Examination. In Ethiopia, the enrollment in undergraduate regular programs has increased significantly from 98,404 in 2004 to 388,186 in 2018 (5). An increase in student enrollment may lead to challenges related to SRH unless corresponding services are also expanded. Increased enrollment means more students requiring SRH information, counseling, and clinical care. Many students enter university with limited knowledge about SRH, and without access to appropriate services (6), they may struggle to make informed decisions or adopt preventive health behaviors, such as consistent condom use, regular testing for Sexually transmitted infections (STI), and effective contraceptive use, leaving them more vulnerable to unintended pregnancies, STIs, and other negative SRH outcomes. Furthermore, even when students possess the right knowledge, their behaviors can still be influenced by peers and significant others, which may lead to risky or inconsistent practices.

Furthermore, university students face barriers to accessing SRH services, including stigma, cultural taboos, misinformation, and fear of judgment, factors that may be exacerbated in diverse and growing academic environments. If these barriers are not proactively addressed, the consequences can include increased rates of unintended

pregnancies, STIs, and poor mental health outcomes. Therefore, understanding and addressing the SRH needs of university students is essential to promoting their overall well-being, academic success, and long-term health.

Risky sexual behavior (RSB)

According to the World Health Organization (WHO), health related behavior refers to the actions or practices of individuals or communities that directly influence health outcomes. These behaviors include dietary patterns, physical activity, substance use such as alcohol and tobacco, adherence to medical advice, and participation in preventive health services such as screenings (7). Importantly, WHO emphasizes that health behaviors are not solely determined by individual knowledge or motivation; rather, they are shaped by a complex interplay of psychological, social, cultural, and environmental factors. A comprehensive understanding of the factors that facilitate or hinder health behavior is essential for the development of effective interventions that promote healthy lifestyles (8).

Risky behaviors are actions that can result in physical or mental harm. These include the use of alcohol, tobacco, or other drugs; engagement in unsafe sexual practices; involvement in violent activities; and the adoption of unhealthy dietary habits. Such behaviors are associated with a wide range of adverse health and social outcomes, both in the short and long term (9). Globally, over 1.5 million adolescents and young adults aged 10–24 years died in 2021; an average of approximately 4,500 deaths per day. A significant proportion of these deaths were linked to preventable causes, including substance use, unsafe sex, and injury-related incidents (10). A multi-country study examining the co-occurrence and determinants of health risk behaviors among adolescents (aged 10–19 years) in sub-Saharan Africa, China, and India reported that approximately 89.2% of adolescents engaged in at least two risky behaviors. These included physical inactivity, poor dietary habits, smoking, alcohol consumption, and risky sexual behavior. The findings underscore the widespread prevalence of multiple health-compromising behaviors among adolescents in these regions and highlight the urgent need for comprehensive, multi-sectoral interventions (11).

A risky sexual behavior is one that increases the likelihood of adverse sexual and reproductive health consequences. Such behaviors include: unprotected sexual intercourse, having multiple sexual partners, and sexual activity under the influence of substances (12). Many young people engage in risky behaviors and experiences that can result in unintended health outcomes such as HIV infection, sexually transmitted diseases (STD), and unintended pregnancy (13,14).

Although both men and women can engage in RSB, a meta-analysis conducted among college and university students in sub-Saharan Africa, as well as studies on

patterns of sexual risk behavior among undergraduate students in Ethiopia, have shown that men are at a higher risk of engaging in such behaviors (15,16). According to the Ethiopian HIV national strategic plan (2021-2025), adolescent girls and young women who are at higher risk for STIs are one of the seven priority populations. This group includes females aged 10-24 years who are sexually active at least once in the past 12 months and who meet one or more of the following characteristics: have multiple sexual partners or sex with non-regular partners, are involved in transactional sex, or are victims of sexual exploitation, are involved in substance abuse, have a history of STD, and unintended pregnancy, or abortion. According to the Ministry of Health, Ethiopia, such high risk women can be found especially at higher learning institutions (17).

The Ethiopian National Adolescent and Youth Health Strategy (2021-2025) is designed to meet the needs of young people beyond reproductive health issues such as adolescent nutrition, substance use, mental health, non-communicable diseases, injuries, gender-based violence, early/ child marriage, female genital mutilation/ cutting (18). Although the strategy adopts a holistic approach to youth health by addressing issues beyond reproductive health, it does not include university students as a specific target group. This omission has significant implications, as university youth face unique health challenges such as academic stress, risky behaviors, and limited access to youth-friendly services. Excluding this group risks reinforcing health inequities and leaves a large, educated, and influential segment of the youth population underserved, potentially leading to an increase in SRH problems among university students.

Risky sexual behavior among university students

University students might be exposed to factors influencing RSB for several reasons. These include freedom from parental supervision and exploration. For many students, university is the first time they are living independently, and they may not have the guidance or supervision that they had at home, which can contribute to riskier behaviors and exploration of sexuality. This can lead to experimentation, including casual encounters, which may not involve consistent condom use (19). The university environment can encourage experimentation and risky behaviors due to peer pressure and the desire to fit in with social groups (20). Alcohol and drug use are common among university students and can impair judgment, leading to decisions to engage in unprotected sex or with multiple partners (21,22). Further, university life including academic pressure can bring about stress and mental health challenges. Students may turn to risky behaviors including RSB as a way to cope or use drinking venues in the nearby vicinity, which can lead to engaging in risky behaviors. Finally, many students may not have received adequate sexual education before or after joining the university, leading to

gaps in their knowledge about safe sex practices and the consequences of risky behaviors.

A meta-analysis of RSB among college and university students in sub-Saharan Africa reported a pooled prevalence of 36.0% for having multiple sexual partners and 53.0% for inconsistent condom use. The overall prevalence of engaging in at least one form of risky sexual behavior was 65.0% (15). In Ethiopia, several studies have assessed the prevalence and determinants of RSB among university students. The prevalence of RSB among sexually active university students ranged from 30.2% to 44% (23–25). Specifically, the proportion of university students who reported having more than one sexual partner in the past 12 months ranged from 16.8% (26) to 61.1% (23), while inconsistent or non-use of condoms ranged from 40.2% (23) to 81% (25). Various factors have been significantly associated with RSB among university students in Ethiopia and Kenya, including early sexual debut (26), alcohol consumption and experiences of sexual violence (21), being male (15,16,27), and substance use (22). Most of the aforementioned studies defined RSB as engaging in sexual activity combined with at least one of the following behaviors: inconsistent condom use, or having multiple sexual partners, or early initiation of sexual activity, or sex with commercial sex workers (23,24). Additionally, each study was conducted at a single university. This thesis defines RSB more specifically as having both multiple sexual partners and inconsistent condom use with new sexual partners. This more stringent definition allows for more effective and efficient interventions targeting those at high risk particularly in resource limited settings like Ethiopia. Moreover, this thesis is based on data collected from six universities across the country, enhancing its generalizability.

Overview of HIV/AIDS

HIV remains a major global public health problem, with an estimated 39.9 million people living with HIV at the end of 2023, 65% of whom are in the African Region. In 2023, an estimated 630, 000 people died from HIV-related causes and an estimated 1.3 million people acquired HIV(28).

In Ethiopia, the distribution of the HIV epidemic is mixed, with substantial regional variations, concentrated in urban areas and some geographic hotspots driven by key and priority populations (17). In 2023, the estimated prevalence of HIV among adults aged 15 years and above in Ethiopia was 0.87% and about 54,455 youth aged 15–24 years were living with HIV. In addition, the annual estimated new HIV infections and deaths related to AIDS among this age group were 2,457 and 922, respectively, in 2023 (29).

Unintended pregnancies and abortion

Globally, an estimated 121 million unintended pregnancies occurred each year among women of reproductive age between 2015 and 2019. Of these, 61% of unintended pregnancies ended in abortion annually (30). In sub-Saharan Africa, the annual average unintended pregnancy rate was 91 pregnancies per 1000 women and 37% of unintended pregnancies ended in abortion between 2015 and 2019 (30,31). In Ethiopia, a multilevel analysis from the EDHS 2016 showed that prevalence of unintended pregnancy was 29.7% (32) and an estimated 620,300 induced abortions were performed in 2014 with an annual abortion rate of 28 per 1,000 women aged 15–49 (33). Furthermore, the prevalence of unwanted pregnancy among university students in Ethiopia has ranged from 8.1% to 18.6 % (34,35). The pooled prevalence of induced abortion among female students in higher education institutions in Ethiopia was 5.1%, and the rate of induced abortion was 51 per 1000 women (36) and 18.6% among college students in Debre Tabor town, Ethiopia (35).

In Ethiopia, abortion is legal under specific circumstances, as outlined in the country's revised laws and guidelines. These include cases of rape or incest, risks to the woman's health, fetal impairment, physical or mental disabilities of the woman, pregnancy in minors, and situations involving grave and imminent danger (37). Outside of these legally permitted conditions, women seeking abortion are often forced to do so through unsafe and illegal means.

Exposure to violence

According to the World Health Organization (WHO), violence is the intentional use of physical force or power, threatened or actual, against oneself, another person, or a group or community that either results in or has a high likelihood of resulting in injury, death, psychological harm, maldevelopment, or deprivation (38). Violence is a public health challenge due to its widespread prevalence and adverse outcomes on physical, mental, sexual, and reproductive health. Furthermore, violence causes significant social and economic costs for victims, their families, and societies, including intergenerational cycles of violence, lower academic performance, and reduced productivity (39–41). The four most common forms of violence are physical, sexual, psychological violence, and violence involving deprivation or neglect (42). Globally, an estimated 736 million women aged 15 and older (about one in three) have been subjected to physical and/or sexual intimate partner violence, non-partner sexual violence, or both at least once in their life. This figure does not include sexual harassment (43) and another estimate indicated that one in seven (13%) experienced this violence in the past year (44). Furthermore, of those

who have been in a relationship, 16% of young women aged 15 to 24 experienced this violence in the past 12 months globally (45).

While both men and women can be victims of violence, there is limited information available about male victims of violence in Ethiopia or neighboring countries. In United States, approximately one in 10 men experienced contact sexual violence, physical violence, and/or stalking by an intimate partner during their lifetime (46). In Australia, 6.1% and 42% of men aged 18 years and above experienced sexual and physical violence, respectively (47). According to the 2016 Ethiopian Demographic and Health Survey (EDHS), among women aged 15-49, the prevalence of physical violence ever and in the past 12 months was 23% and 15 %, respectively. Furthermore, the prevalence of sexual violence ever and in the past 12 months was 10% and 7%, respectively (48). However, EDHS does not provide prevalence rates of violence exposure among men.

Violence among university students

University students can be at risk for exposure to violence as university enrollment is the first time that they are away from parental supervision, which can increase their exposure to behaviors associated with experiences of violence, such as alcohol consumption (49–51) and drug use (52–54). Additionally, university enrollment is a time of investigation of new things, such as being in relationships and having sex. Although students are often independent and make their own decisions, power imbalances with peers and teachers can increase their risk of exposure to violence. Understanding the magnitude of campus violence is challenging due to underreporting of incidents and the use of inconsistent survey methodologies (55) and it also varies across contexts. In the United States and Canada, 17% of male and 16% of female university students reported experience of violence (56). A study conducted in Italy found that lifetime exposure to psychological and physical peer or school violence was more common among male university students than female students (21.5% vs. 9.7%) (57). In southwestern Uganda, a study on sexual coercion, interpersonal violence, and mental health among university students revealed that 31.1% had experienced some form of sexual coercion in their lifetime. Additionally, 27.8% reported perceived threats or threats of violence, and 9.6% experienced actual physical violence within the past year (58). Notably, the study found no significant gender differences in exposure to sexual coercion, perceived threats, or physical violence (58). In Ethiopia, a study among female students showed that 9.8% had experienced completed rape in their lifetime, and among who had these experiences, 1.6% had experienced it after joining the university (59). Similarly, a study among female university students in Ethiopia reported a 15.3% lifetime prevalence of rape, and among those who had these experiences, 8% had experienced it after joining the university and 2.3% within the current academic year (60). The majority of

studies on violence exposure in Ethiopia have predominantly focused on women, particularly in the context of intimate partner and sexual violence. While these studies have provided critical insights into the experiences and health consequences of violence among women, they have largely overlooked the experiences of men. As a result, there is a significant knowledge gap regarding the prevalence, nature, and impact of violence among male populations, especially male university students, who may also be vulnerable to various forms of violence, including physical assault, emotional abuse, and sexual violence. This lack of data limits the development of comprehensive, gender-inclusive prevention and intervention strategies within academic settings and beyond.

In higher education, a combination of individual factors, group processes, institutional factors, and community factors have been shown to contribute to violence exposure across the countries (55). Studies in Ethiopia, South Africa, India, and Turkey identified factors significantly associated with violence among university students; these were being in the age group 20–24 (61), childhood rural residence (62), being a second-year student (63), being married or living with a male partner (63–65), having a father with no formal education (63), alcohol consumption (62,63), substance/drug use (66), witnessing domestic violence (62), and not being able to freely discuss issues with their families (63).

In Ethiopia, political instability can significantly increase young people's exposure to violence, with universities often emerging as hotspots for its escalation. These institutions bring together diverse students with varied backgrounds, perspectives, and political affiliations, fostering an atmosphere of active political discourse. However, this diversity, coupled with broader national tensions, can sometimes heighten divisions and fuel conflict. As a result, universities can serve as settings where students experience violence.

Substance use and alcohol consumption

Substance use is the use of selected substances, including alcohol, tobacco products, illicit drugs, inhalants, and other substances that can be consumed, inhaled, injected, or otherwise absorbed into the body with possible dependence and other detrimental effects (67). Substance use has negative consequences that range from injury, criminal justice involvement, and school dropout, to death (68). Globally, alcohol and drug use contribute to over 3 million deaths each year. In 2019, alcohol consumption was responsible for approximately 2.6 million deaths, with the highest numbers reported in the European and African regions. Notably, young people aged 20–39 years accounted for the highest proportion (13%) of alcohol-attributable deaths that year (69).

University students are exposed to new social settings where alcohol and drug use are commonly part of entertainment (70). According to the 2016 EDHS, 46.7% of youth aged 15 to 24 reported occasional or daily substance use in the 30 days preceding the survey, 56.3% of males and 40% of females. Among respondents, 36.3% reported alcohol consumption and 12.6% reported chewing khat (71).

A systematic review and meta-analysis study of substance use showed alcohol and khat were the most commonly used substances among university students in Ethiopia (72). Cross-sectional studies conducted on substance use and alcohol consumption among university students in Ethiopia revealed that the current prevalence of chewing khat ranged from 5.7% to 40.2% (54,73–75), alcohol use ranged from 17% to 28%, (73–75) and illicit drug use ranged from 4% to 16.2% (54,74).

The relationship between the use of different types of substances has been examined in various studies. A study on substance use among university instructors in southwest Ethiopia reported that, among substance users, 24.4% used both alcohol and khat, while 12.9% used alcohol, khat, and cigarettes (76). Another study among khat users in Ethiopia found that alcohol consumption often followed khat use. This is due to alcohol consumption used to counteract the stimulating effects of khat (77). Similarly, a study on dual alcohol and khat use among adult males in Ethiopia revealed that 9.0% of participants used both alcohol and khat (78). Studies on substance and alcohol use among university students and youth in Ethiopia and Kenya identified several factors associated with substance use, including alcohol consumption. These include being male (71,73,79–81), older age (71), less engagement in religious practices (81), khat chewing (79), having family members with substance and alcohol consumption (73,79,80), peer pressure (79–81) availability and affordability of substance (80,81), and having higher monthly income (73). Furthermore, a meta-analysis and a study examining the relationship between substance use and sexual activity among young adults in the 48 contiguous U.S. states found that sexually active individuals are more likely to engage in risky behaviors, such as substance use and alcohol consumption, compared to those who are not sexually active (82,83).

Theoretical framework

Bronfenbrenner’s Ecological Theory

For this thesis, Bronfenbrenner's ecological theory model was used to explain the interaction among factors contributing to increased risky sexual behavior, exposure to violence, and substance use including alcohol among university students in Ethiopia. Urie Bronfenbrenner was a Russian-born American psychologist (84) best known for having developed the human ecology theory (ecological systems theory), in which individuals are seen as maturing not in isolation but within the context of relationships, such as those involving families, friends, schools, neighborhoods, and society. Bronfenbrenner divided the entire ecological system in which human growth occurs into five subsystems that are organized socially: the microsystem, mesosystem, exosystem, macrosystem, and chronosystem (85–87).

Nowadays, young people navigate a range of social environments that shape their attitudes and behaviors. These include the effects of globalization, national and community-level changes, such as the shift from rural to urban lifestyles, and evolving dynamics within families, schools, and workplaces. These settings are deeply interconnected, each playing a role in influencing how young people behave and relate to others. Importantly, they can serve as sources of both risk and protection for young people. To promote positive outcomes for young people, it is essential to understand the factors that increase vulnerability as well as those that offer protection (88).

Factors that increase the vulnerability of university students to risky sexual behavior, exposure to violence, and substance use include individual characteristics such as age, gender, marital status, and residence and cognitive factors including knowledge, attitudes, and self-perception regarding HIV acquisition. Individual traits and behavioral patterns such as inconsistent condom use, multiple sexual partners, substance use, and alcohol consumption do not operate in isolation. Rather, they interact dynamically with various environmental and social contexts, influencing the decisions and experiences of students (88). Understanding these interrelated factors is essential for developing effective interventions aimed at reducing risk and promoting the well-being of university students. Accordingly, this study incorporates variables related to individual, behavioral, and environmental aspects to deepen our understanding of the factors that contribute to RSB, violence exposure, and substance use in this population.

Figure 1 shows an adapted version of Bronfenbrenner's ecological model for understanding increased risky sexual behavior and/or violence exposure and/or substance and alcohol use. The various levels included in the model are described separately below.

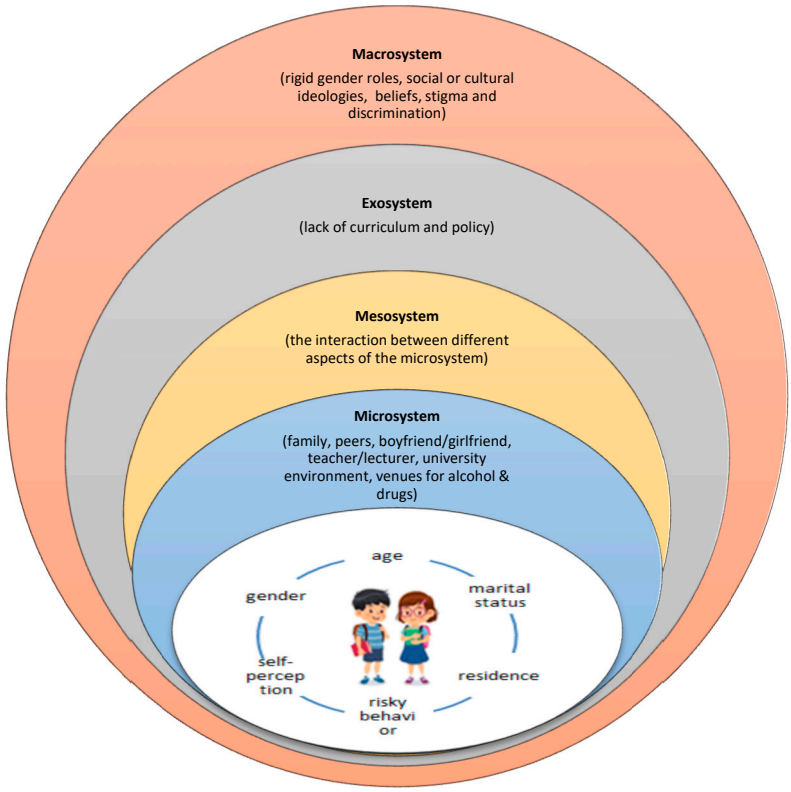

Figure 1: Bronfenbrenner's ecological theory as a framework for understanding increased risky sexual behavior and/or violence exposure among university students in Ethiopia

Microsystem: This system is the one that is closest to the individual's everyday life. It includes the people, institutions, and services that individuals directly interact with in their immediate environment (89). University students have different networks and relationships with their family, peers, boyfriend/girlfriend, classmates, teacher/lecturer, university environment, etc. which could increase the likelihood of being exposed to RSB, violence exposure, and substance use. These interactions play a critical role in shaping students' behaviors and decisions, often serving as either risk or protective factors. Furthermore, the interactions can also affect proper condom use, having a sexual partner, and alcohol and substance use either positively or negatively. For instance, peer pressure or partner influence may

encourage unprotected sex or substance use, while supportive relationships may promote safer practices and healthier choices. A prospective socio-ecological examination of substance use and sexual risk among African American youth revealed that peer promotive factors such as prosocial behavior and peer support and family promotive factors such as family involvement and parental support were strongly associated with increased condom use. In contrast, peer risk factors such as substance use and delinquent behavior and family risk factors such as parental substance use and family conflict were strongly associated with increasing substance use as youth aged (90). In this thesis, we specifically examined how factors at the microsystem level affected individual behaviors such as proper condom use, having multiple sexual partners, substance and alcohol use, and others.

Mesosystem: includes interactions between various aspects of the microsystem (85). For university students, the mesosystem includes the dynamic interplay between their personal relationships (e.g., peers, romantic partners, lecturers) and the broader institutional or community settings that surround them. A critical aspect of this is the availability and accessibility of high-risk environments and services around the university campuses—such as bars, nightclubs, and venues where drugs are used. These settings often become social hubs for students and may facilitate behaviors that increase vulnerability to risky sexual practices, violence, and substance abuse. The proximity and ease of access to such venues can amplify the influence of peer networks and social expectations, potentially normalizing behaviors like excessive alcohol consumption, substance use, and unprotected sexual activity. These interactions between different microsystems, such as peer influence intersecting with the availability of risk-promoting environments, create a context where risk-taking behavior is more likely to occur. In this thesis, we explored how these mesosystem-level factors contribute to the exposure of university students to violence and RSB. For example, we examined the relationship between the university generation (i.e., the setting) and risky sexual behavior and exposure to violence.

Exosystem: includes systems, policies, and institutions that influence an individual's daily settings but are not part of that individual's immediate environment (89). For university students in Ethiopia, exosystem-level factors include national and institutional policies, educational systems, and health service infrastructures that shape their access to information, support, and protection. A critical gap at this level is the absence or limited implementation of comprehensive sexuality education (CSE) within university curricula. This could restrict students' access to appropriate and culturally relevant information on sexual and reproductive health including HIV prevention, violence, and substance use. The lack of coordinated policies and institutional frameworks to address the unique sexual and reproductive health needs of university students not only limits their knowledge but also weakens prevention and response mechanisms for risky sexual behavior (RSB), violence, and substance abuse. In the absence of such supportive systems, students

may rely on misinformation from peers or social media, increasing their vulnerability to harmful behaviors and outcomes.

The macrosystem is the outermost layer of Bronfenbrenner's model which includes social or cultural ideologies and beliefs that affect an individual's environment (85). These broader cultural forces influence how individuals and communities perceive and respond to various issues including violence, gender roles, sexuality, and health behavior. In many developing countries, including Ethiopia, individuals who experience violence particularly gender-based or sexual violence, often face significant stigma and social marginalization. This stigma can arise from various factors, including cultural beliefs, social norms, and misconceptions that may blame victims, question their credibility, or associate their experiences with shame or dishonor. As a result, survivors may be discouraged from disclosing their experiences or seeking support, which can lead to further isolation and long-term psychological and social consequences. Furthermore, masculinity norms linked to aggression and dominance, rigid gender roles, and acceptance of interpersonal violence (91) contribute to violence exposure. In this thesis students' place of residence (urban/rural) before joining the university was assessed to examine the powerful influence of cultural and ideological factors in shaping university students' experiences, particularly regarding exposure to violence. Understanding the role of the macrosystem is crucial for developing culturally sensitive interventions that challenge harmful norms and promote safer, more equitable environments for young people (Figure 1).

Protective and risk factors across various levels of the ecological system (microsystem, mesosystem, exosystem, and macrosystem) contribute to shaping individual behaviors and experiences either positively or negatively. For instance, at the microsystem level, a student surrounded by peers who frequently consume alcohol or engage in risky sexual behavior is more likely to adopt similar behaviors due to direct social influence and daily interaction. A study on the influence of socio-environmental risk factors on risk-taking behaviors among Bahamian adolescents showed that parental monitoring was a strong protective factor against behavioral intentions and engagement in risk behaviors, whereas environmental risk predicted increased behavioral intentions and risk behaviors (94). At the mesosystem level, regular communication between a student's family and university mentors can create a supportive network that reinforces healthy decision-making, thereby reducing the likelihood of substance use or risky sexual behavior. In contrast, conflict or a lack of communication between these groups may increase the student's vulnerability to engaging in risky behaviors. At the exosystem level, broader university policies can significantly influence student behavior. For example, strict enforcement of alcohol regulations or the availability of accessible counseling services can indirectly reduce substance use and exposure to violence among students. At the macrosystem level, societal attitudes toward alcohol, sexuality, and violence shape perceptions of what is considered acceptable or risky

behavior within the university setting. For instance, if the broader culture normalizes binge drinking or casual sex, students may be more likely to engage in these behaviors.

Conceptual linkages between the three papers

Figure 2 illustrates the conceptual linkages between the three papers. These linkages describe the complex nature of the interrelationships between risky sexual behavior, exposure to violence, and substance and alcohol use.

As illustrated in Figure 2, substance and alcohol use play a pivotal role in increasing the likelihood of engaging in RSB and experiencing violence. Impaired judgment, lowered inhibitions, and heightened impulsivity associated with substance use often lead to unsafe sexual practices and greater vulnerability to violent situations. Conversely, students who experienced violence whether physical, emotional, or sexual, or who engaged in RSB may turn to substance or alcohol use as a coping mechanism to manage trauma, stress, or social pressures. Those involved in RSB may also be at higher risk of experiencing various forms of violence, such as intimate partner violence, sexual coercion, or assault. This, in turn, may reinforce a cycle of maladaptive coping through continued substance use.

Paper I explored factors associated with RSB and examined individual characteristics, substance and alcohol use, and exposure to violence as potential influences. Paper II examined determinants of violence exposure, focusing on individual factors and substance and alcohol use as possible risk contributors. Paper III identified patterns of alcohol and substance use and predictors of such patterns using latent class analysis. Furthermore, risky sexual behavior, exposure to violence, and substance/alcohol use, especially when they co-occur, can lead to a wide range of adverse outcomes that affect physical, mental, social, and economic well-being including academic performance.

Altogether, these findings reveal a bidirectional and cyclical relationship among the three domains (RSB, violence, and substance use) where each may serve as both a cause and consequence of the others. This interconnection highlights the need to approach these issues not as separate challenges but as mutually reinforcing problems that require integrated and holistic prevention and intervention strategies. Programs targeting university students should account for the overlapping nature of these risks and aim to simultaneously address behavioral health, trauma, and sexual health within the broader framework of student well-being and campus safety (Figure 2).

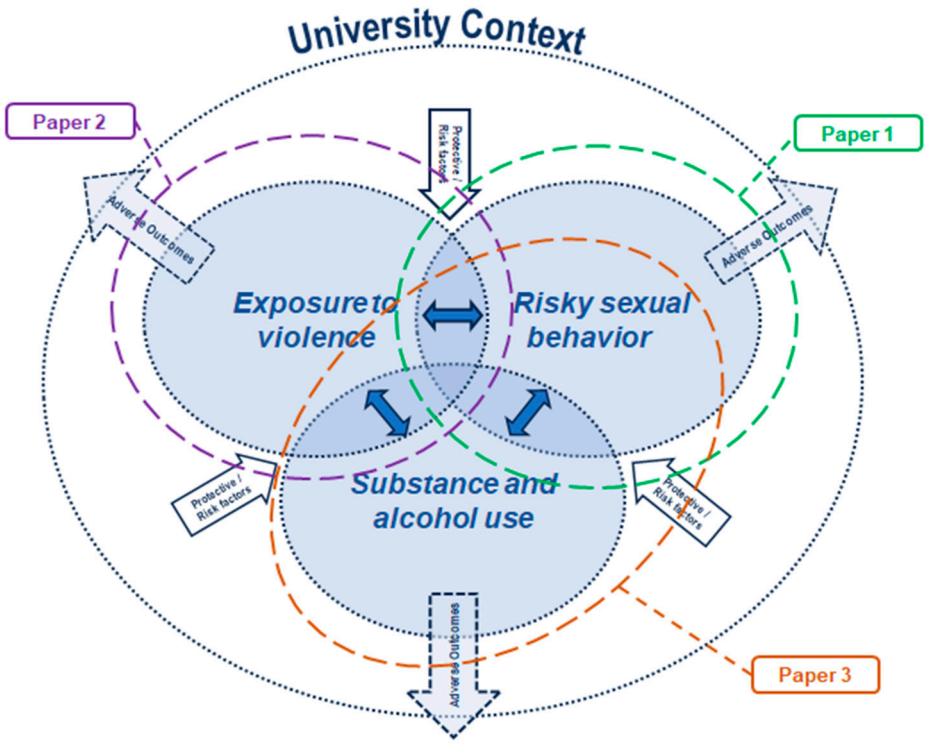

Figure 2: Conceptual linkages between the three papers

Sustainable Development Goals (SDGs)

The current studies are closely aligned with the SDGs set for 2030, with a particular emphasis on promoting health and social well-being. Specifically, they contribute to SDG 3.3, which aims to end the epidemics of HIV/AIDS, as well as SDG 3.5, which focuses on strengthening the prevention and treatment of substance abuse, including the harmful use of alcohol and narcotic drugs. Furthermore, the studies support SDG 5.2, which seeks to eliminate all forms of violence against women and girls in both public and private settings, including trafficking, sexual exploitation, and other forms of abuse (92). Together, these studies provide valuable insights to inform multisectoral efforts aimed at achieving these global targets.

Rationale

The number of university students in Ethiopia is rapidly increasing, which may bring significant challenges in meeting their sexual and reproductive health needs. Despite this, there is a lack of comprehensive research on the prevalence of risky sexual behavior, exposure to violence, patterns of substance and alcohol use as well as the factors associated with these issues among university students. Existing studies in Ethiopia have typically focused on a single university and, in the case of violence, studies primarily examined gender-based violence affecting women and girls (62–64,93). Moreover, although several studies have explored the prevalence and associated factors of substance and alcohol use among university students, to the best of our knowledge, no study has examined their patterns using latent class analysis (LCA). This highlights a critical gap in understanding the complex interplay of these issues in the university context.

Knowledge is needed about the magnitude and associated factors of RSB, exposure to violence, and also the patterns of substance and alcohol use among both male and female university students in Ethiopia. Therefore, this thesis aims to address this gap by examining the extent and determinants of RSB and violence exposure, and by identifying distinct patterns of substance and alcohol use within this population. Generating such knowledge is essential to inform evidence-based interventions and prevention strategies that address sexual and reproductive health challenges, particularly RSB, violence, and other risky behaviors within the university setting.

Aims

General aims

The overall aim of this doctoral thesis is to examine risky sexual behavior, exposure to violence, and associated lifestyle factors among university students in Ethiopia and also to identify patterns related to substance use and alcohol consumption behavior.

Specific aims

Aim I: To examine the risky sexual behavior and associated factors among university students in Ethiopia (Paper I).

Aim II: To assess the prevalence of and factors associated with violence exposure among male and female university students in Ethiopia (Paper II).

Aim III: To identify latent classes of substance use and alcohol consumption behavior and to identify the predictors of latent class membership among sexually active university students in Ethiopia (Paper III).

Materials and Methods

The current thesis is a multifaceted study that uses quantitative methods to examine data obtained from a comprehensive survey, where paper I explores the prevalence of and factors associated with risky sexual behavior, paper II examines the prevalence of and factors associated with violence exposure and paper III identifies latent classes of substance use and alcohol consumption behavior and predictors of latent class membership among university students in Ethiopia. Table 1 shows an overview of the materials and methods used in each of the studies.

Table 1: Overview of the materials and mthods of papers incuded in the thesis

Papers	Study design	Data source	Participants	Data analysis
I	Quantitative cross-sectional	A structured self-administered questionnaire	2988 students at six randomly selected universities in Ethiopia	Descriptive and multivariable regession analysis
II	Quantitative cross-sectional	A structured self-administered questionnaire	2988 students at six randomly selected universities in Ethiopia	Descriptive and multivariable regession analysis
III	Quantitative cross-sectional	A structured self-administered questionnaire	523 sexualy active students at six universities in Ethiopia	Latent class analysis and multinomial logistic regression

Study design, population and samples

For the three papers, a cross-sectional study was conducted at six randomly selected public universities across different regions and city administrations in Ethiopia. These were Hawassa University, Dire Dawa University, Bahir Dar University, Ambo University, Addis Ababa University, and Adama University. Bahir Dar and Hawassa Universities, located 552 km northwest and 278 km south of Addis Ababa, respectively, are known for their scenic landscapes and cultural attractions. Dire Dawa and Adama Universities situated approximately 515 km and 79 km east of Addis Ababa are located in regions recognized for industrial activities. Ambo University positioned 114 km west of Addis Ababa, lies in an agricultural hub.

Addis Ababa University, the oldest in the country, is located in the capital city (Figure 3). Data collection took place between August 2021 and February 2022.

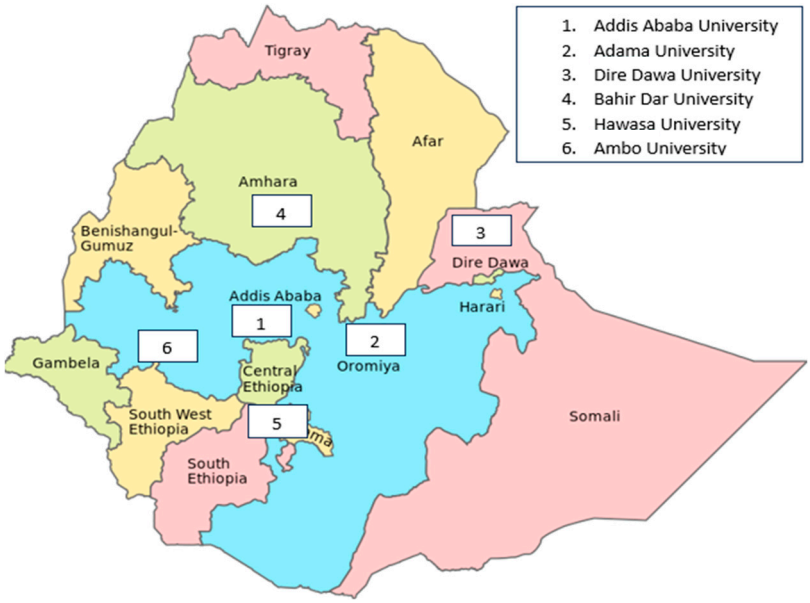

Figure 3: Location of Ethiopian universities included in the survey, 2022

The study participants for all three papers were undergraduate university students in their second and third years. First-year students were excluded due to their limited time on campus, as their exposure to RSB, violence exposure, and substance and alcohol use may not yet have been fully developed. Similarly, fourth- and fifth-year students were not included, as they had typically completed their coursework and were off-campus for apprenticeships or internships. For the third paper, the analysis was restricted to students who had been sexually active in the past 12 months, based on evidence from previous studies indicating that sexually active students are more likely to engage in risky behaviors, including substance use and alcohol consumption, compared to their non-sexually active peers (82,83). This paper also explores the association between latent class membership, based on substance and alcohol use patterns, and risky sexual behaviors. By identifying distinct behavioral subgroups, the study offers valuable insights that can inform the design of targeted interventions addressing the underlying factors contributing to risky behaviors among university students.

The survey sample size was determined using a single population proportion considering a 45.4% prevalence of sexual violence among female university students (60), a 95% CI, a design effect of 1.2, and a non-response rate of 10%. The

calculated sample size was 493 for each university. The total sample size for the six universities was 2958. However, from the selected departments all students who were willing to participate in the study were included, yielding a total sample size of 2988 participants. For the third paper, only students who were sexually active in the last 12 months (n=523) were included in the analysis.

To ensure a representative and diverse sample of university students across different institutional contexts, a two-stage stratified sampling technique was used. In the first stage, universities were stratified based on their year of establishment into two categories: first-generation and second-generation institutions. This stratification aimed to assess whether the risk of exposure to RSB, violence, and substance and alcohol use differed by the maturity level of the universities and the nature of their surroundings. First-generation universities include Addis Ababa, Bahir Dar, and Hawassa University, which are older and have facilities that expose the students to risky behaviors such as nightclubs, bars, and venues where substances are used, and thus are more established than second-generation universities such as Dire Dawa, Ambo, and Adama University. At the time of study, there were nine first-generation and twelve second-generation universities. Three universities were randomly selected from each generation using the lottery method.

In the second stage of sampling, about 19 academic departments were randomly selected from each participating university using Microsoft Excel. This approach was based on the assumption that students' likelihood of exposure to RSB and violence would not differ significantly across academic disciplines. Prior to data collection, lists of departments were obtained from the registrar's office at each university to facilitate random selection. Students in the selected departments were approached during their regular classroom sessions, where they were provided with detailed information about the study's purpose, procedures, and ethical considerations. Participation was entirely voluntary, and those who agreed to take part signed a written informed consent form. Data were then collected through a self-administered questionnaire, completed by participants in the classroom setting under the supervision of trained data collection coordinators (See Figure 4 for sampling procedure).

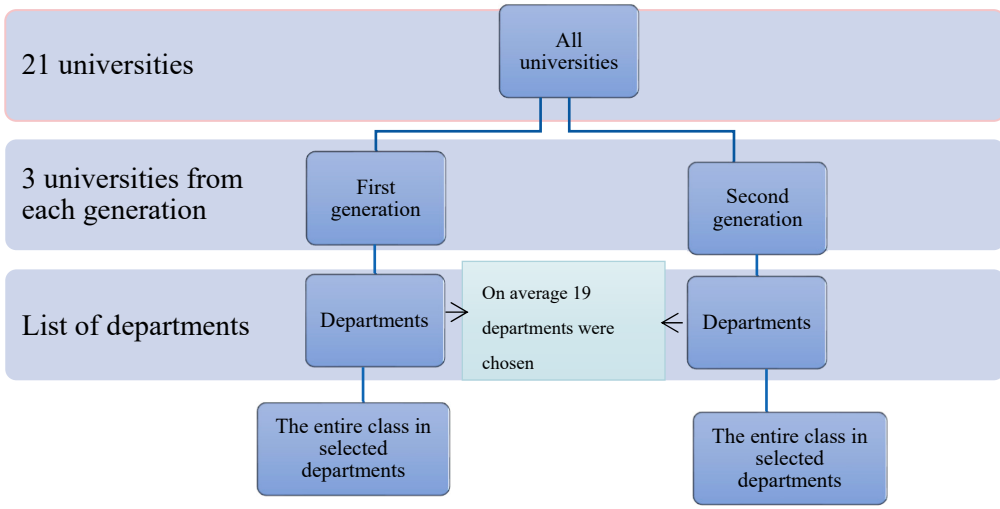

Figure 4: Sampling procedure among undergraduate university students

Data collection tool

The questionnaire was comprehensive and included items about background characteristics, sexual behavior, HIV/AIDS and related questions, alcohol and substance use, and exposure to violence. Items pertaining to HIV/AIDS were adapted from a validated questionnaire about comprehensive knowledge of HIV (94), the model AIDS Indicator Survey questionnaires developed for EDHS (95,96). Violence related questions were adapted from the EDHS questionnaire (97,98), and items about substance and alcohol use were adapted from the WHO alcohol consumption indicator code book (99) and other previous similar studies (59,62–64,100–104). Furthermore, the questionnaire was prepared in English and then translated into two local languages (Amharic and Oromifa) by professional language translators. It was pre-tested on 296 students (10%) of the total sample) and the inputs were included in the final version of the questionnaire. However, those who participated in the pretest were not included in the final sample. Training was given to data collection coordinators about data collection procedures; close monitoring and supervision were conducted by the principal investigator.

HIV testing was performed for those students who volunteered, using the national testing algorithm. The testing was not mandatory for participation in the study.

Measures

Dependent variables

For Paper I, the dependent variable was risky sexual behavior. Risky sexual behavior (RSB) was a composite variable, defined as having both sexual relationships with more than one partner and using condoms with a new sexual partner irregularly or not at all in the last 12 months.

Sexually active in the last 12 months was defined as vaginal or anal or oral sexual intercourse, assessed through the question "Have you had sex in the past 12 months?" Response options included "Yes, vaginal sex", "Yes, anal sex", "Yes, oral sex" and "No". Participants who selected at least one of the "Yes" responses were classified as sexually active, while those who chose "No" were considered not sexually active in the past 12 months. The number of partners was obtained using an open-ended question: "In the past 12 months, how many sexual partners have you had?" Responses were dichotomized as having one sexual partner and more than one sexual partner. Condom use frequency was assessed with the question, "How often do you use a condom with a new sexual partner?", Response options included "Always", "Often", "Sometimes", and "Never". Participants who selected "Often", "Sometimes", or "Never" were considered irregularly or not at all using condoms.

For Paper II, the dependent variable was exposure to violence. It was assessed in the form of experience of emotional, physical, and sexual violence, within two time frames: "ever" and "during the last 12 months". For this analysis, exposure to violence was defined as experiencing at least one type of violence at least once during the last 12 months. Emotional violence was assessed with the question, "Have you been exposed to any of the following threats or threats of violence (ever and in the past 12 months) that were so dangerous or serious that they scared you?" The response options included (someone) "Said or did something to humiliate you in front of others", "Threatened to hurt or harm you or someone close to you", "Insulted you or made you feel bad about yourself", "Other, specify" and "No". Participants who answered affirmatively to at least one of the options except "no" were classified as having experienced emotional violence. Physical violence was assessed with the question, "Have you been a victim of any of the following physical violence at any time (ever and during the past 12 months)?", The response options included (someone) "Pushed you, shook you, or threw something at you", "Slapped you", "Twisted your arm or pulled your hair", "Punched you with his/her fist or with something that could hurt you", "Kicked you, dragged you, or beat you up", "Tried to choke you or burn you on purpose", "Threatened or attacked you with a knife, gun, or any other weapon", "Other, specify", and "No". Participants who responded affirmatively to at least one of the options except "no" were considered to have experienced physical violence. Sexual violence was assessed with the question

"Have you ever been and during the past 12 months raped or forced to have sex against your will?" Response options were "Yes" and "No". Participants who answered "Yes" were classified as having experienced sexual violence. To measure the frequency of physical and sexual violence, participants were asked an open-ended question, "In the past 12 months, how many times has someone physically hurt you/ raped you or forced you to have sex against your will?". Information about the perpetrator was obtained by asking participants, "The last time this has happened, what was your relationship to the perpetrator? If it was more than one person, what was your relationship to the person who initiated the violence the most recent time this happ-ened?", where the response choices were "Boyfriend/girlfriend", "Teacher/ lecturer", "Other student/classmate", "Husband/wife", "Family member", "Person unknown to me/ stranger" and "Other (specify)".

For Paper III, the dependent variables were the four class memberships: class 1 "non-users", class 2 "alcohol consumers", class 3 "substance users" and class 4 "substance users and alcohol consumers".

Independent variables

For Paper I, the independent variables include age, sex, relationship status, religion, generation of the university, year of study, living status on campus, residence before coming to the university, monthly average expenditure, age at the start of sex, alcohol induced blackout, frequency of drinking alcohol in the past month, heavy episodic drinking (HED) in the past one month, chewing khat, frequency of substance used in the past month, emotional violence experience in the last 12 months, raped/forced sex experience in the last 12 months, self-perception about the risk of acquiring HIV and HIV/AIDS knowledge, and current contraceptive use.

For Paper II, the independent variables were age, sex, relationship status, religion, residence before coming to the university, generation of the university, year of study, living status on campus, frequency of alcohol drinking in the last month, HED in the past one month, chewing khat in the last 12 months, and use of any other drugs in the last 12 months.

For Paper III, the independent variables were age, sex, relationship status, residence before coming to the university, year of study, living status on campus, living condition while attending secondary school, monthly average expenditure, number of sexual partners in the last 12 months, inconsistent condom use, early sexual debut, ever had HIV test, and sexual violence experience in the last 12 months.

Age was obtained by an open-ended question and categorized into three groups for analysis: 18–20 years, 21–24 years, and 25 years or older.

Relationship status was dichotomized as "in a relationship" and "not in a relationship". Participants were classified as "In a relationship" if they reported having a boyfriend or girlfriend, being married, or living together.

Residence was dichotomized as urban or rural, based on the Ethiopian Central Statistical Authority classification. A locality was considered urban residence if it had at least 2000 inhabitants, includes all administrative capitals of regions, zones, and woredas, or has at least 1000 people primarily engaged in non-agricultural activities and/or was officially designated as urban by the administrative authority. All other areas were classified as rural residences (105).

Living status on campus was assessed through the question, "Where do you live?", with response options: "on campus" which is living on university premises and "off campus" which is living outside the university. Participants were also asked about their living conditions during secondary school using the question, "Did you mostly live at home or away from home while attending secondary school?" The response options were "at home" and "away from home". Additional demographic information collected included sex, religion, year of study, and faculty of study.

Alcohol consumption

Participants were asked whether they had ever experienced alcohol induced blackout, with response options: "I do not drink alcohol", "I don't remember", "No, I didn't consume so much alcohol", "Yes, before the past 12 months", and "Yes, in the past 12 months". Those who reported experiencing alcohol induced blackouts during the past 12 months were classified as having experienced alcohol induced blackout. Those who affirmed that they do not drink alcohol or did not consume so much alcohol were considered as not having experienced alcohol induced blackout. In addition, those who responded, "I don't remember" were considered as missing. Participants also reported their alcohol consumption frequency in the past month, with the following response options: "I do not drink alcohol", "Less often than once every two weeks", "Once every two weeks or more", "Once a week or more", "Every day", and "Other". Those who drank every day and once a week or more were considered as drinking once a week or more. Those who drank once every two weeks or more and less often than once every two weeks were considered drinking less often than once a week. Furthermore, responses of “other” without further specification were considered as missing. Participants were also asked about heavy episodic drinking (HED) defined as those who ever consumed five or more (for men) or four or more (for women) standard drinks of alcohol on at least one occasion in the past 30 days (106). Thus, participants were asked the question, "Have you ever consumed four/five or more standard drinks of alcohol on at least one occasion?", Response options included "Never", "Yes, before the last 12 months" "Yes, in the last 12 months", "Yes, in the last one month" and "Yes, in the last one week". For the current analysis, those who answered "Yes, in the last one month"

and "Yes, in the last one week" were considered as engaging in HED while all other responses were considered as "No".

Substance use

Substance use was assessed by asking participants, "Have you used any substances/drugs/intoxicants other than alcohol in the past 12 months?" The response options included "Khat", "Ganja (Atsefaris)", "Hashish", "Cocaine", "Inhaling solvents such as benzine or glue", "Marijuana (cannabis)", "Never used", and "Other, specify". For the current analysis, participants who chose any of the substances were categorized as "Yes". Those who reported using substances other than khat, such as ganja (atsefaris), hashish, inhaling solvents, marijuana, and cannabis were classified as having "used any other drugs". Khat (Catha edulis) is a stimulant plant containing the alkaloid cathinone, which induces excitement and euphoria (107). Ganja is a colloquial term for cannabis, particularly the dried flowers and leaves of the Cannabis sativa plant (108). The frequency of substance or drug use in the past month was asked using the question "How often have you used the drugs or intoxicants during the past month?" The response options included, "Less often than once every two weeks", "Once a week or more", "Once every two weeks or more", "Every day", "I do not use drugs or intoxicants", and "Other specify". Those who reported using substances every day and once a week or more were considered as using once a week or more. Those who used substances once every two weeks or more and less often than once every two weeks were considered as using less often than once a week. Furthermore, responses of "Other" without additional details were treated as missing data. The frequency of substance or drug use applied to all types of substances or drugs.

HIV/AIDS knowledge and self-perception of acquiring HIV

The HIV/AIDS knowledge section of the questionnaire included 13 questions, with scores ranging from 0 to 13. Correct answers were coded as 1 and incorrect answers as 0, and each participant's total score was calculated by summing their correct responses. The mean score was then determined, and participants scoring above the mean (>8) were classified as having higher HIV/AIDS knowledge, while those scoring below the mean were categorized as having lower knowledge. To assess self-perceived risk of acquiring HIV, participants were asked: "In your opinion, what is your risk of contracting HIV?" Response options included "I am not at risk", "I am at low risk", "I am somewhat at risk", "I am at high risk", and "I am at very high risk". For analysis, those who selected "I am somewhat at risk", "I am at high risk" or "I am at very high risk" were considered at risk of acquiring HIV.

Age at sexual debut

Age at sexual debut was assessed using an open-ended question and categorized into three groups: "10 to 17 years old", "18 to 20 years old", and "21 years or older." For

analysis, participants who initiated sexual activity before age 18 were classified as having had an early sexual debut.

Current use of contraceptive method

Current contraceptive use was assessed with the question: "Do you or your partner currently use a modern contraceptive method?" Response options were "Yes" and "No." Modern contraceptives include pills, intrauterine devices (IUDs), injectables, condoms, Norplant, diaphragms, spermicides, tubal ligation, vasectomy, and the rhythm method (safe period abstinence). Participants who selected "Yes" and reported using any of these methods during the data collection period were classified as current contraceptive users.

Monthly average expenditure

Monthly average expenditure was assessed using an open-ended question and categorized into three groups based on the cost of living during the study period: less than 1000 birr (<$20), 1001–2000 birr ($20–$40), and more than 2000 birr (>$40).

Data analysis

After the data collection, double entry was performed using EpiInfo version 7.2.2.12 by two independent data clerks to ensure consistency and then exported to SPSS Version 26 for analysis. Data collected from all six universities were combined into a single dataset for the final analysis. Descriptive statistics were used to summarize the data through frequency tables and percentages. To assess associations, crude and adjusted odds ratios (ORs) with 95% confidence intervals (CIs) were calculated. A correlation analysis was conducted to check for multi-collinearity. A significance level of $p \leq 0.25$ was used to identify candidate variables for the final multivariable analysis, ensuring that important predictors were not excluded too early. Statistical significance was accepted at the p-value < 0.05. Cases with missing values were excluded from the analysis.

For Paper III, to identify behavioral patterns related to substance use and alcohol consumption, Latent Class Analysis (LCA) was performed. LCA estimates class-specific probabilities for observed categorical variables (109). In this study, six behavioral indicators were analyzed: chewing khat in the past 12 months, using any other substance in the past 12 months, using all types of substances in the past month, engaging in HED in the past month, consuming alcohol in the past month and experiencing alcohol-induced blackouts in the past 12 months. All LCA indicators were dichotomized for better interpretability. To determine the optimal number of latent classes, we started with a two-class model and progressively

increased the number of classes up to ten. The selection of the final model was based on: Bayesian Information Criterion (BIC), Akaike Information Criterion (AIC), Consistent AIC (CAIC), Sample-Size Adjusted BIC (SABIC), p-value, and Entropy (109) value greater than 0.8, with values closer to 1 indicating clearer classification (110). Considering both interpretability and model fit criteria, a four-class model was selected for further analysis (111).

To examine predictors of latent class membership, multinomial logistic regression was performed using bias-adjusted Step 3 analysis (112,113) in Latent GOLD 6.0(111,114). ORs and 95% CIs were performed by converting log odds ratios using an Excel spread sheet. All LCA analyses were conducted in Latent GOLD 6.0 (111).

Ethical considerations

Ethical approval for all of the studies in the thesis was obtained from the Scientific and Ethical Research Office (SERO) of the Ethiopian Public Health Institute (EPHI) (reference number EPHI 6.13/609). Before data collection, written informed consent was obtained from each participant, ensuring they fully understood the purpose, procedures, potential risks, and benefits of the study. Participants were informed that their participation was entirely voluntary, and they had the right to decline participation or withdraw at any stage without any consequences.

To protect participants' privacy, no personally identifiable information was collected. All responses were anonymized, and confidentiality was maintained throughout the research process. After completing the questionnaire, students left the questionnaire in a designated collection box provided in the classroom. Furthermore, the data collection was facilitated by individuals who were external to the participating universities. Data were securely stored and only accessible to authorized researchers. All study team members received comprehensive training on ethical research practices, with a specific emphasis on protecting participants' privacy and maintaining data confidentiality. The training covered key aspects such as obtaining informed consent, handling sensitive information, ensuring secure data storage, and preventing unauthorized access. Additionally, ethical guidelines were followed to ensure the study upheld the principles of autonomy, beneficence, non-maleficence, and justice in accordance with national and international research ethics standards (115).

Results

This section begins with a brief presentation of the sample characteristics, followed by the results of Paper I, II, and III.

Study population characteristics (Paper I and Paper II)

A total of 2,988 students (94.4%) responded to the questionnaire out of the 3,165 students in the selected departments. Among them, 81.9% had been tested for HIV, with the proportion increasing to 86.7% among those who completed the questionnaire. The majority (68.7%) were aged 21–24 years, and 65.1% were male. Most participants (80.7%) were not in a relationship. Regarding religion, 56.5% identified as Orthodox Christians. Approximately three-fourths (73.0%) had lived in urban areas before coming to the university, and 77.1% had resided at home during secondary school. Regarding their field of study in the university, about one-fourth of the participants were from the Faculty of Business and Economics, and another one-fourth from the Institute of Technology. Most (92.8%) of the students lived on campus, and half of them were second-year students. More than half (66.8%) reported a monthly average expenditure of less than 1,000 birr (<20$) (Table 2).

Sexual and other related behavioral characteristics

Among the participants in the study, 27.8% of them ever had sexual intercourse, and out of this, 69.3% were sexually active in the last 12 months. Only 24.0% of those who had ever had sex consistently used condoms. In the last 12 months, 30.7% reported always using condoms, 29.9% had multiple sexual partners, and 46.2% used contraceptives currently. Furthermore, in this study, HIV testing was conducted where 5 (0.2%) of the students were HIV positive among all study participants and 3 (0.57%) among those who engaged in risky sexual behavior in the last 12 months (Table 3).

Table 2: Socio-demographic characteristics of undergraduate students at six universities in Ethiopia, 2022 (N = 2988)

Variable	Frequency (N)	Percent (%)
Age (n=2817)		
18 - 20 years	783	27.8
21 - 24 years	1936	68.7
>25 years	98	3.5
Missing	171	
Sex (n=2911)		
Female	1016	34.9
Male	1895	65.1
Missing	77	
Relationship status (n=2841)		
In relationship	549	19.3
Not in relationship	2292	80.7
Missing	147	
Religion (n=2911)		
Orthodox Christian	1645	56.5
Catholic	33	1.1
Protestant	744	25.6
Muslim	442	15.2
Other	47	1.6
Missing	77	
Residence before coming to the university (n=2855)		
Urban	2085	73.0
Rural	770	27.0
Missing	133	
Living conditions while attending secondary school (n=2893)		
At home	2230	77.1
Away from home	663	22.9
Missing	95	
Generation of the university (n=2988)		
First generation	1497	50.1
Second generation	1491	49.9
Faculty (n=2968)		
Faculty of Natural and Computational Science	539	18.1
Faculty of Medicine	48	1.6
Faculty of Social and Human Science	636	20.7
Faculty of Law	228	7.6
Faculty of Business and Economics	771	25.9
Faculty of Institute of Technology	746	25.0
Missing	20	
Year of study (n=2988)		
Second year student	1467	49.1
Third year student	1521	50.9
Living status on campus (n=2838)		
On campus	2635	92.8
Off campus	203	7.2
Missing	150	
Monthly average expenditure (n=2025)		
< 1000 birr (<20$)	1353	66.8
1001 - 2000 birr (20-40)	467	23.1
> 2000 birr (>40$)	205	10.1
Missing	963	

Note: Cases with missing data were not included in the analysis

Table 3: Sexual and other related behavioral factors among undergraduate students at six universities in Ethiopia, 2022 (N = 2988)

Variable	Frequency (N)	Percent (%)
Ever had sexual intercourse (n=2778)		
Yes	771	27.8
No	2007	72.2
Missing	210	
Sexually active in the past year (n=755)		
Yes	523	69.3
No	232	30.7
Missing	16	
Frequency of condom use with a new sexual partner (n=691)		
Never	269	38.9
Sometimes	152	22.0
Often	104	15.1
Always	166	24.0
Missing	80	
Frequency of condom use in the last 12 months (n=469)		
Never	129	27.5
Sometimes	109	23.2
Often	87	18.6
Always	144	30.7
Missing	54	
Number of sexual partner/s in the last 12 months (n=481)		
One	337	70.1
More than one	144	29.9
Missing	42	
Self-perception on the risk of acquiring HIV (n=501)		
Perceived at risk	173	34.5
Not perceived at risk	328	65.5
Missing	22	
HIV/AIDS knowledge (n=501)		
Higher	310	61.9
Lower	191	38.1
Missing	22	
Currently used contraceptive (n=457)		
Yes	211	46.2
No	246	53.8
Missing 66		
HIV test result (n=2592)		
Positive	5	0.2
Negative	2,587	99.8
HIV test result among RSB (n=523)		
Positive	3	0.57
Negative	520	99.43

Note: Cases with missing data were not included in the analysis

Substance use and alcohol consumption behavior

Among all participants, 9.3% had experienced an alcohol-induced blackout, and 5.8% reported episodes of heavy episodic drinking. Regarding substance use, 10.8% and 7.0% of the respondents chew khat ever and in the last 12 months, respectively. Additionally, 8.6% and 6.7% of the respondents used any other drug ever and in the last 12 months, respectively (Table 4).

Table 4: Substance use and alcohol consumption among undergraduate students at six universities in Ethiopia, 2022 (N = 2988)

Variable	Frequency (N)	Percent (%)
Alcohol induced blackout (n=2682)		
Yes	249	9.3
No	2433	90.7
Missing	306	
Frequency of alcohol drinking in the last month (n=2535)		
Once a week or more	124	4.9
Less often than once a week	351	13.8
Did not drink alcohol	2060	81.3
Missing	453	
Heavy episodic drinking in the last month (n=2814)		
Yes	163	5.8
No	2651	94.2
Missing	174	
Ever chewing khat (n=2725)		
Yes	294	10.8
No	2431	89.2
Missing	263	
Chewing khat in the last 12 months (n=2868)		
Yes	201	7.0
No	2667	93.0
Missing	120	
Ever used any other drugs (n=2725)		
Yes	235	8.6
No	2490	91.4
Missing	263	
Used any other drugs in the last 12 months (n=2869)		
Yes	192	6.7
No	2677	93.3
Missing	119	
Frequency of all types of substance use in the last month (n=2776)		
Once a week or more	142	5.1
Less often than once a week	172	6.2
Did not use substance or drug	2462	88.7
Missing	212	

Note: Cases with missing data were not included in the analysis

Paper I: Risky sexual behavior

Among those sexually active students (n= 523) in the past year, 144 (29.9%) reported having more than one partner and 325 (69.3%) did not consistently use condoms. In this thesis, the prevalence of RSB, defined as both having multiple sexual partners and not always using condoms, was 19.5% (n = 102) among those who had sexual intercourse in the last 12 months and 3.4% among the total study participants (n = 2,988).

Factors associated with risky sexual behavior

Table 5 presents the results of the bivariable and multivariable logistic regression analyses examining factors associated with RSB. The analysis included 523 participants who were eligible for RSB in the past 12 months.

In the fully adjusted model, where all variables were mutually controlled, the multivariable analysis identified significant associations between RSB and age (21–24 years), age at sexual initiation (10–17 years), and experience of emotional violence in the past year. The adjusted odds ratio (AOR) indicated that students aged 21–24 years had lower odds of engaging in RSB (AOR = 0.18, 95% CI: 0.03–0.98) compared to those aged 25 and above. Conversely, students who initiated sexual activity between the ages of 10–17 had 6.7 times higher odds of RSB (AOR = 6.7, 95% CI: 1.26–35.30) than those who started at 21 or older. Additionally, students who had experienced emotional violence in the past year had 3.9 times higher odds of engaging in RSB (AOR = 3.9, 95% CI: 1.33–11.39) compared to those without such experiences (Table 5).

Table 5: Bivariable and multivariable logistic regression analysis of factors associated with RSB among undergraduate students at six universities in Ethiopia, 2022 (n = 523)

Variables	Total	COR (95% CI)	p-value	AOR (95% CI)	p-value
Age					
18 - 20 years	92	1.77 (0.69-4.49)	0.234*	0.29 (0.04-1.90)	0.195
21 - 24 years	361	1.08 (0.46-2.53)	0.864	0.18 (0.03-0.98)	0.047**
> 25 years	42	1	.	1	
Sex					
Female	144	1			
Male	362	1.29 (0.78-2.12)	0.323		
Relationship status					
Married/in a relationship	208	1			
Not in a relationship	285	1.27 (0.81-2.02)	0.300		
Religion					
Orthodox Christian	253	1			
Catholic	7	1.95 (0.37-0.40)	0.433		
Protestant	143	1.24 (0.74-2.10)	0.416		
Muslim	87	1.27 (0.69-2.35)	0.439		
Other	15	1.78 (0.54-5.84)	0.344		
Generation of the university					
First	231	0.95 (0.61-1.47)	0.815		
Second	292	1			
Year of study					
Second year student	227	1		1	
Third year student	296	1.69 (1.07-2.67)	0.023*	2.68 (1.0-7.25)	0.052
Living status in campus					
On campus	435	1	0.918		
Off campus	56	0.96 (0.48-1.94)			
Residence before coming to the university					
Rural	130	1	0.925		
Urban	367	0.98 (0.59-1.61)			

Variables	Total	COR (95% CI)	p-value	AOR (95% CI)	p-value
Monthly average expenditure					
< 1000 birr (<20$)	175	1		1	
1001 - 2000 birr (20-40)	109	1.64 (0.91-2.99)	0.103	2.03 (0.73-5.69)	0.177
> 2000 birr (>40$)	47	2.23 (1.06-4.69)	0.035*	1.16 (0.30-4.52)	0.835
Age at the start of sex					
10 to 17 years	129	2.85 (1.33-6.13)	0.007*	6.68 (1.26-5.30)	0.025**
18 to 20 years	244	1.08 (0.51-2.30)	0.833	1.443 (0.29-.11)	0.652
21 and above years	67	1		1	
Ever consumed so much alcohol that you couldn't remember what happened the next day					
I do not drink alcohol	256	1		1	
I don't remember	87	0.59 (0.17-2.05)	0.408	1.42 (0.216-.33)	0.716
No, didn't consume so much alcohol	38	1.13 (0.62-2.07)	0.692	0.74 (0.18 -3.13)	0.683
Yes, before last 12 months	91	0.51 (0.17-1.50)	0.223*	0.18 (0.02-1.99)	0.162
Yes, in the last 12 months	25	1.30 (0.73-2.32)	0.375	1.60 (0.55-4.70)	0.391
Frequency of drinking alcohol in the past month					
Less often than once every two weeks	70	0.81 (0.40-1.60)	0.537		
Once every two weeks or more	53	1.02 (0.49-2.11)	0.959		
Once a week or more	43	0.76 (0.32-1.79)	0.526		
Every day	18	0.49 (0.11-2.18)	0.346		
I do not drink alcohol	269	1			
Heavy episodic drinking in the past one month					
Yes	69	0.90 (0.46-1.76)	0.764		
No	407	1			
Chewing khat (n=491)					
Yes	78	1.80 (1.04-3.13)	0.037*	1.26 (0.29-5.41)	0.758
No	413	1		1	
Frequency of substance used in the past month					
Less often than once every two weeks	42	1.40 (0.65-3.00)	0.385	0.84 (0.18 -3.98)	0.829
Once a week or more,	39	1.34 (0.61-2.98)	0.464	1.01 (0.19-5.25)	0.989
Once every two weeks or more,	33	1.43 (0.62-3.33)	0.401	0.93 (0.146-5.90)	0.938

Variables	Total	COR (95% CI)	p-value	AOR (95% CI)	p-value
Every day	21	0.22 (0.03-1.70)	0.148*	0.36 (0.03-5.32)	0.459
I do not use drugs or intoxicant	340	1		1	
Emotional violence experienced in the last 12 months					
Yes	166	1.42 (0.90-2.24)	0.128*	3.89(1.33-11.39)	0.013 **
No	338	1		1	
Raped/forced sex experience in the last 12 months					
Yes	46	1.63 (0.82-3.25)	0.161*	0.86 (0.19-4.00)	0.85
No	417	1		1	
Self-perception on the risk of acquiring HIV					
Perceived at risk	173	2.21 (1.41-3.44)	0.001*	1.81(0.713-4.59)	0.212
Not perceived at risk	328	1		1	
HIV/AIDS knowledge					
Higher	310	1		1	
Lower	191	1.99 (1.28-3.12)	.002*	1.18 (0.45-3.07)	0.742
Currently used contraceptive					
Yes	211	1		1	
No	246	2.72 (1.65-4.47)	<0.001*	1.95 (0.77-4.94)	0.157

Note: * P-value <0.25 was used for multivariable analysis; ** P-value < 0.05; COR = Crude Odds Ratio; AOR = Adjusted Odds Ratio; CI= Confidence interval; 1= Reference category

Paper II: Exposure to violence

The overall prevalence of lifetime exposure to any form of violence was 24.9% (n=742), and the prevalence of exposure to violence within the past 12 months was 17.6% (n=525). When categorized by type of violence experienced in the last 12 months, 17.8% (n=508) of participants reported exposure to emotional violence, 12.3% (n=349) experienced physical violence, and 3.3% (n=87) were subjected to sexual violence.

The prevalence of lifetime exposure to at least one type of violence was 25.5% (n=482) among males and 23.6% (n=240) among females. In the past 12 months, the prevalence of violence exposure was 17.9% (n=340) for males and 16.5% (n=168) for females (Figure 5).

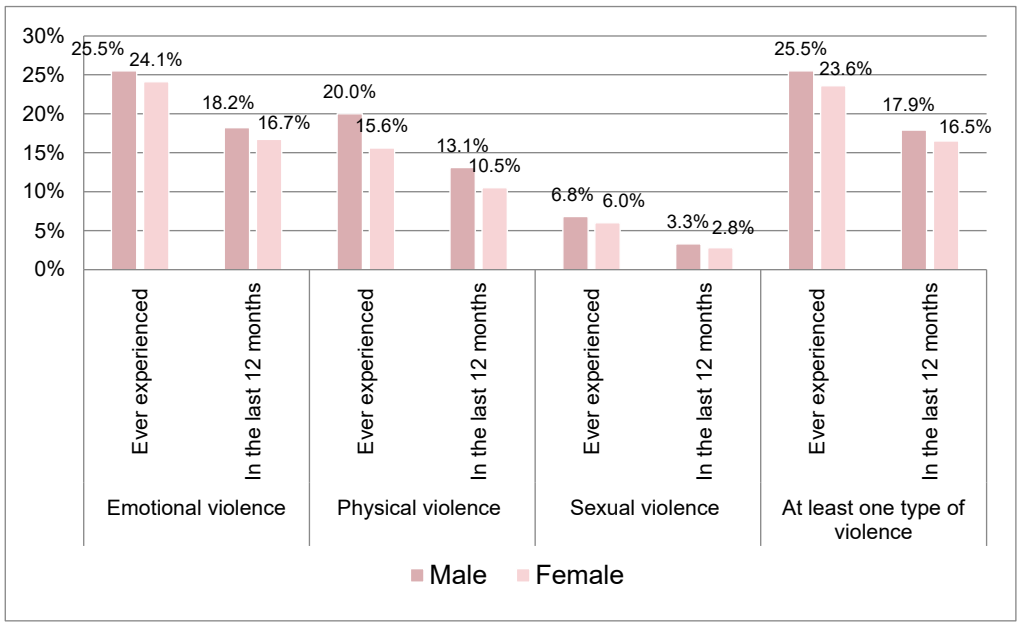

Figure 5: Exposure to different types of violence by gender, 2022

Concerning the frequency of violence experienced, 41.9% and 13% of students reported experiencing physical and sexual violence more than once, respectively.

The proportion of students who experienced different forms of violence and the type of perpetrator who had initiated the most recent incident are presented in Table 6. The most common perpetrators of emotional and sexual violence were intimate partners (boyfriends/girlfriends) which accounts for 27.7% and 39.3%, respectively. Additionally, physical violence was most frequently perpetrated by other students or classmates (25.5%).

Table 6: Perpetrators and different types of violence experienced by undergraduate university students in Ethiopia, stratified by gender of respondent, 2022

Perpetrators	Emotional violence (n=623)				Physical violence (n=399)				Sexual violence (n=143)			
	Male		Female		Male		Female		Male		Female	
	N	%	N	%	N	%	N	%	N	%	N	%
Boyfriend/girlfriend	130	31.3	41	19.7	73	25.9	28	23.9	40	43.0	17	34.0
Teacher/lecturer	65	15.7	34	16.3	42	14.9	13	11.1	22	23.7	7	14.0
Other student/ classmate	102	24.6	42	20.2	82	29.1	23	19.7	8	8.6	11	22.0
Husband/wife	23	5.5	16	7.7	5	1.8	3	2.6	2	2.2	3	6.0
Family member	33	7.9	26	12.5	28	9.9	18	15.4	11	11.8	8	16.0
Person unknown to me/ stranger	40	9.6	34	16.3	36	12.8	25	21.4	3	3.2	3	6.0
Other	22	5.3	15	7.2	16	5.7	7	6.0	7	7.5	1	2.0

Note: Cases with missing data were not included in the analysis

Factors associated with violence exposure

Both bivariable and multivariable logistic regression analyses were performed to identify factors contributing to violence exposure in the last 12 months (Table 7).

In the multivariable logistic regression analysis, after adjusting for all variables, several factors were found to be significantly associated with the experience of violence. Students older than 25 years had 2.9 times higher adjusted odds of experiencing violence (95% CI: 1.6–5.0) compared to those aged 18–20 years. Being in a relationship was associated with a 1.4 times higher likelihood of experiencing violence (95% CI: 1.0–2.0) compared to students who were not in a relationship. Additionally, students who had lived in rural areas before attending university had 1.4 times higher odds of experiencing violence (95% CI: 1.1–1.8) compared to those from urban residences. Students enrolled in first-generation universities had 1.4 times higher odds of experiencing violence (95% CI: 1.1–1.8) than those in second-generation universities. Regarding alcohol consumption, students who consumed alcohol at least once a week or more had 2.2 times higher odds of experiencing violence (95% CI: 1.3–3.6) compared to those who had not consumed alcohol in the past month. Furthermore, students who had chewed khat had 1.6 times higher odds of experiencing violence (95% CI: 1.0–2.4), and those who had used other drugs had 2 times higher odds (95% CI: 1.3–3.1) (Table 7).

Table 7: Bivariable and multivariable logistic regression analysis of factors associated with exposure to violence among undergraduate university students in Ethiopia, 2022 (N = 2988)

Variables	COR (95% CI)	p-value	AOR (95% CI)	p-value
Age				
18 - 20 years	1		1	
21 - 24 years	1.2 (1.0-1.5)	0.119*	1.1 (0.8-1.5)	0.422
>25 years	2.9 (1.8-4.6)	<0.001*	2.9 (1.6-5.0)	<0.001**
Sex				
Female	0.9 (0.7-1.1)	0.341		
Male	1			
Relationship status				
In relationship	1.6 (1.3-2.0)	<0.001*	1.4 (1.0-2.0)	0.002**
Not in relationship	1		1	
Religion				
Orthodox Christian	1		1	
Catholic	2.4 (1.1-4.9)	0.022*	1.9 (0.7-5.6)	0. 228
Protestant	1.0 (0.8-1.3)	0.987	0.9 (0.7-1.2)	0 .528
Muslim	1.0 (0.7-1.3)	0.814	1.0 (0.7-1.5)	0.813
Other	1.0 (0.5-2.1)	0.940	1.1 (0.4-2.8)	0.844
Residence before coming to the university				
Rural	1.4 (1.1-1.7)	0.003*	1.4 (1.1-1.8)	0.015**
Urban	1		1	
Generation of the university				
First	1.3 (1.0-1.5)	0.016*	1.4 (1.1-1.8)	0.006**
Second	1		1	
Year of study				
Second-year	1		1	
Third-year	1.2 (1.0-1.4)	0.156*	1.0 (0.8-1.3)	0.821
Living status on campus				
In campus	1		1	
Out of campus	0.7 (0.5-1.1)	0.081*	0.6 (0.4-1.1)	0.111
Frequency of alcohol drinking in the last month				
Once a week or more	2.8 (1.9-4.2)	<0.001*	2.2 (1.3-3.6)	0.002**
Less often than once a week	1.8 (1.3-2.3)	<0.001*	1.4 (1.0-2.1)	0.050
Did not drink alcohol	1		1	
Heavy episodic drinking in the past one month				
Yes	2.0 (1.4-2.8)	<0.001*	1.0 (0.6-1.7)	0.975
No	1		1	
Chewing khat in the last 12 months				
Yes	1.8 (1.3-2.5)	<0.001*	1.6 (1.0-2.4)	0.039**
No	1		1	
Used any other drugs in the last 12 months				
Yes	2.9 (2.2-4.0)	<0.001*	2.0 (1.3-3.1)	0.001**
No	1		1	

* P-value <0.25; ** P-value < 0.05; COR = Crude Odds Ratio; AOR = Adjusted Odds Ratio; CI= Confidence interval; 1= Reference category
Note: P-value <0.25 was used as the cut-off point for inclusion in the multivariable analysis.

Paper III: Patterns of substance use and alcohol consumption

Socio-demographic characteristics of the study participants

This study included a total of 523 sexually active students. The majority (72.9%) were between the ages of 21 and 24 years, and 71.5% were male. More than half (57.8%) were not in a relationship, and nearly three-fourths (73.8%) came from a urban residence. Furthermore, 56.6% of them were third-year students, and the majority (88.6%) living on campus. About half (52.9%) had a monthly average expenditure of less than 1000 birr (<$20) (Table 8).

Table 9 presents substance use, alcohol consumption, and sexual behaviors among sexually active students.

Concerning substance use, 15.9% of participants reported using khat, and 11.0% had used any other drugs in the past 12 months. Additionally, more than a quarter (28.4%) reported using substances or drugs in the last month. In terms of alcohol consumption, 18.3% of participants had experienced alcohol-induced blackouts, 40.6% consumed alcohol in the past month, and 14.5% reported engaging in HED during the same period.

Regarding the sexual behavior of the study participants, 29.9% reported multiple sexual partners, more than half (69.3%) of them had used condoms inconsistently, and 29.3% of them had experienced early sexual initiation. Furthermore, about half (48.7%) of participants had taken an HIV test and 9.9% of them had experienced sexual violence in the last 12 months (Table 9).

Table 8: Socio-demographic characteristics of sexually active undergraduate students at six universities in Ethiopia, 2022 (N=523)

Variable	Frequency (N)	Percent (%)
Age (n=495)		
18 - 20 years	92	18.6
21 - 24 years	361	72.9
>25 years	42	8.5
Missing	28	
Sex (n=506)		
Female	144	28.5
Male	362	71.5
Missing	17	
Relationship status (n=493)		
In relationship	208	42.2
Not in relationship	285	57.8
Missing	30	
Religion (n=505)		
Orthodox Christian	253	50.1
Catholic	7	1.4
Protestant	143	28.3
Muslim	87	17.2
Other	15	3.0
Missing	18	
Residence before coming to the university (n=497)		
Urban	367	73.8
Rural	130	26.2
Missing	26	
Living conditions while attending secondary school (n=504)		
At home	389	77.2
Away from home	115	22.8
Missing	19	
Faculty (n=516)		
Faculty of Natural and Computational Science	96	18.5
Faculty of Medicine	8	1.5
Faculty of Social and Human Science	132	25.4
Faculty of Law	35	6.7
Faculty of Business and Economics	118	22.7
Faculty of Institute of Technology	127	24.5
Missing	7	
Year of study (n=523)		
Second year student	227	43.4
Third year student	296	56.6
Living status on campus (n=491)		
On campus	435	88.6
Off campus	56	11.4
Missing	32	
Monthly average expenditure (n=331)		
< 1000 birr (<20$)	175	52.9
1001 - 2000 birr (20-40)	109	32.9
> 2000 birr (>40$)	47	14.2
Missing	192	

Note: Cases with missing data were not included in the analysis

Table 9: Substance use, alcohol consumption, and sexual related behaviors among sexually active undergraduate students at six universities in Ethiopia, 2022 (N=523)

Variable	N	%
*Chewing khat in the last 12 months (n=491)		
Yes	78	15.9
No	413	84.1
Missing	32	
*Using any other drug in the last 12 months (n=491)		
Yes	54	11.0
No	437	89.0
Missing	32	
*Substance or drug used in the last 1 month (n=475)		
Yes	135	28.4
No	340	71.6
Missing	48	
*Alcohol-induced blackout (n=497)		
Yes	91	18.3
No	406	81.7
Missing	26	
*Alcohol consumption in the last month (n=453)		
Yes	184	40.6
No	269	59.4
Missing	70	
*Heavy episodic drinking in the last month (n=476)		
Yes	69	14.5
No	407	85.5
Missing	47	
Multiple sexual partners in the last 12 months (n=481)		
Yes	144	29.9
No	337	70.1
Missing	42	
Inconsistent condom use (n=469)		
Yes	325	69.3
No	144	30.7
Missing	54	
Early sexual debut (n=440)		
Yes	129	29.3
No	311	70.7
Missing	83	
Had an HIV test (n=505)		
Yes	246	48.7
No	259	51.3
Missing	18	
Sexual violence in the last 12 months (n=463)		
Yes	46	9.9
No	417	90.1
Missing	60	

*Observed variables used for LCA
Cases with missing data were not included in the analysis.

Model Selection

With six dichotomous indicators, there were 64 possible response patterns (patterns $=2^n$), representing different combinations of participant responses. To identify the optimal latent class model, we fitted models with one to ten latent classes, as shown in Table 10. The selection of the best-fitting model was guided by several statistical criteria, including the Bayesian Information Criterion (BIC), Akaike Information Criterion (AIC), Consistent Akaike Information Criterion (CAIC), and Sample-Size Adjusted BIC (SABIC). In addition, we considered the p-value (p-value >0.05) for model fit, entropy values > 0.8 (indicating good classification quality), and the interpretability of the model results. Based on these criteria, we determined that the four-class latent model provided the best balance between model fit and interpretability. Therefore, we selected this model for further analysis (Table 10).

Table 10: Comparison of LCA models with different latent classes according to the model fit indices

Latent classes	LL	BIC(LL)	AIC(LL)	AIC3(LL)	CAIC(LL)	SABIC(LL)	P-value	Entropy R^2
1	-1408.16	2853.877	2828.32	2834.32	2859.877	2834.832	1.10E-36	1
2	-1260.27	2601.913	2546.539	2559.539	2614.913	2560.648	1.50E-06	0.8767
3	-1203.27	2531.725	2446.534	2466.534	2551.725	2468.241	0.23	0.7951
4	-1172.92	**2514.858**	**2399.85**	**2426.85**	**2541.858**	**2429.154**	**0.95**	**0.8212**
5	-1167.5	2547.835	2403.01	2437.01	2581.835	2439.911	0.97	0.7778
6	-1162.34	2581.33	2406.687	2447.687	2622.33	2451.187	0.98	0.7817
7	-1158.68	2617.824	2413.364	2461.364	2665.824	2465.461	0.98	0.7222
8	-1157.19	2658.658	2424.381	2479.381	2713.658	2484.075	0.98	0.7213
9	-1155.73	2699.547	2435.452	2497.452	2761.547	2502.744	0.96	0.7392
10	-1155.64	2743.199	2449.288	2518.288	2812.199	2524.177	0.92	0.6945

Notes: Best fitting model identified in bold

Latent class probability and class description

Figure 6 illustrates the probability of latent class membership along with the item-response probabilities for each of the four identified classes. The distribution of participants across the classes was as follows: Class 1 comprised 36.7% of the sample, Class 2 included 29.9%, Class 3 accounted for 22.7%, and Class 4 represented 10.8%.

Class 1 was labeled as "non-users" due to participants' low probability of both substance use and alcohol consumption in the past 12 months and the last month. Participants in this class exhibited the lowest probability of engaging in khat chewing (0.8%) compared to all classes, and other drug use (4.0%) compared to those in Classes 3 and 4. Additionally, the probability of substance use in the last month was very low (0.3%) compared to all classes. This class also had the lowest likelihood of alcohol consumption, including HED (0.0%), alcohol use in the last month (0.5%) and alcohol-induced blackout in the past year (0.0%) compared to all classes.

Class 2 was labeled as "alcohol consumers" due to participants' distinctive pattern of drinking behavior yet low likelihood of substance use. This class exhibited a low probability of substance use in both the past 12 months and the last month. Specifically, participants in this class had the lowest probability of khat chewing (1.6%) compared to Classes 3 and 4 and the lowest likelihood of using other drugs (0.2%) compared to Classes 1 and 4. Additionally, their probability of substance use in the last month (0.6%) was lower than that of Classes 3 and 4. However, members of this class had a high probability of alcohol consumption. They exhibited the highest probability of engaging in heavy episodic drinking (HED) (34.8%) than classes 1 and 3, the highest probability of alcohol consumption in the last month (98.6%), and highest probability of alcohol-induced blackout in the past 12 months (38.7%) compared to Classes 1 and 3, distinguishing them as a group primarily characterized by alcohol use.

Class 3 was labeled as "substance users" due to participants' high probability of engaging in substance use and low likelihood of alcohol consumption. Participants in this class exhibited the highest probability of khat chewing (50.4%) compared to all classes, the highest likelihood of using any other drugs (24.0%) than class 1 and 2 and the highest likelihood of engaging in substance use in the last month (91.7%) compared to all classes. However, this group had the lowest probability of alcohol consumption. They reported the lowest likelihood of HED (0.0%), alcohol consumption in the last month (5.1%) and alcohol-induced blackout in the past 12 months (0.1%) compared to classes 2 and 4.

Class 4 was labeled as "both substance users and alcohol consumers" due to participants' high probability of engaging in both substance use and alcohol consumption. This class exhibited the highest likelihood of khat chewing (33.6%) compared to class1 and 2, the highest substance use in the last month (79.7%) compared to class1 and 2, and also had the highest probability of using any other drugs

(36.7%) compared to all classes. Additionally, this class demonstrated the highest probability of HED (48.5%), alcohol consumption in the last month (99.5%), and alcohol-induced blackout in the past 12 months (62.2%) compared to all classes, distinguishing them as the most engaged in both substance and alcohol use (Figure 6).

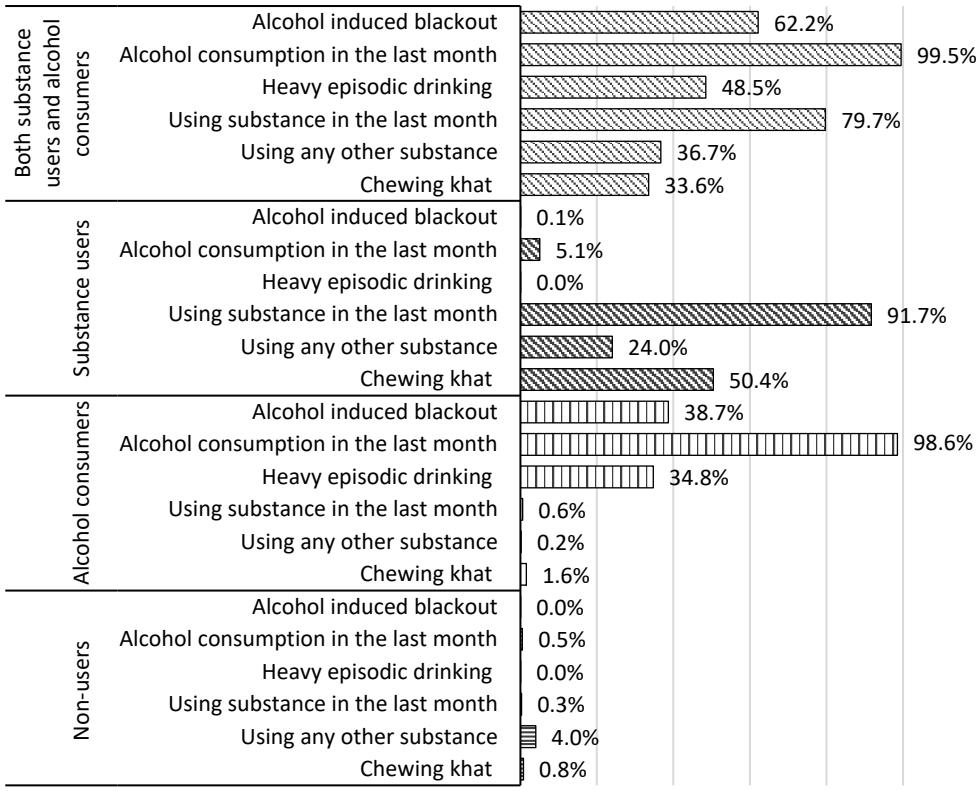

Figure 6: Probability profiles of latent classes among sexual active university students in Ethiopia (N=523)

Latent Class Membership Prediction

The multinomial logistic regression analyses were used to identify factors associated with class membership, using Class 1 (non-users) as the reference group.

Variables related to sexual behavior were included as potential predictors, alongside socio-demographic characteristics. These factors encompassed the number of sexual partners, inconsistent condom use, early sexual debut, history of HIV testing, and experience of sexual violence.

Table 11 shows the results of the crude multinomial logistic regression analysis for factors associated with latent class membership. Geographical origin, monthly average expenditure, and early sexual debut were found to significantly influence class membership (p-value < 0.05) (Table 11).

Table 11: Crude multinomial logistic regression results for factors associated with latent class membership among undergraduate students at six universities in Ethiopia (N = 523)

Model for Classes Covariates	Class 2 COR (95%CI)	Class 3 COR (95%CI)	Class 4 COR (95% CI)	Overall P-value
Age				
18 to 20 years	1	1	1	0.54
21 to 24 years	1.56 (0.83-2.91)	1.47 (0.72-2.98)	0.78 (0.36-1.72)	
> 25 years	1.30 (0.50-3.39)	1.00 (0.32-3.14)	0.08 (0.00-5.64)	
Sex				
Female	1	1	1	0.27
Male	0.72(0.43-1.20)	1.25 (0.67-2.32)	0.75 (0.36-1.55)	
Relationship status				
Not in relationship	1	1	1	0.32
In relationship	1.06 (0.65-1.71)	0.90 (0.52-1.54)	1.80 (0.90-3.58)	
Residence before coming to the university				
Rural	1	1	1	0.049
Urban	0.96 (0.55-1.70)	0.50 (0.28-0.90)*	0.55 (0.26-1.16)	
Year of study				
Second-year student	1	1	1	0.97
Third-year student	0.99 (0.63-1.58)	0.96 (0.57-1.60)	1.15(0.58-2.27)	
Living status on campus				
On campus	1	1	1	0.26
Off-campus	1.69 (0.84-3.40)	0.85 (0.35-2.07)	0.74 (0.21-2.59)	
Living condition while attending secondary school				
At home	1	1	1	0.13
Away from home	0.86 (0.49-1.50)	1.31 (0.73-2.37)	0.38 (0.13-1.10)	
Monthly average expenditure				
<1000 birr (<20$)	1	1	1	0.012
1001-2000 birr (20-40)	1.11 (0.56-2.17)	2.52 (1.22-5.17)*	4.15 (1.50-11.44)*	
> 2000 birr (40$)	1.51 (0.62-3.70)	1.40 (0.46-4.31)	5.26 (1.57-17.66)*	
Number of sexual partners in the last 12 months				
More than one sexual partner	1	1	1	0.34
One sexual partner	1.52 (0.88-2.61)	1.01 (0.57-1.80)	0.82 (0.40-1.67)	
Inconsistent condom use				
Yes	1	1	1	0.66
No	1.26 (0.75-2.12)	0.95 (0.53-1.72)	0.82 (0.37-1.79)	
Early sexual debut				
Yes	1	1	1	0.07
No	0.77 (0.43-1.35)	0.47 (0.26-0.88)*	0.50 (0.22-1.10)	
Ever had HIV test				
Yes	1	1	1	0.12
No	0.63 (0.40-1.01)	1.13 (0.66-1.93)	1.05 (0.53-2.07)	
Sexual violence experience in the last 12 months				
Yes	1	1	1	1.00
No	1.05 (0.45-2.47)	0.97 (0.39-2.41)	0.91 (0.28-2.94)	

*P-value<0.05

Adjusted multinomial logistic regression analyses revealed that students coming from urban residences prior to attending the university had a lower AOR (0.44, 95% CI 0.24-0.84) for membership in Class 3 (substance users) and a lower AOR (0.33, 95% CI 0.14-0.76) for membership in class 4 (both substance users and alcohol consumers) compared to those coming from rural residence. Students with a monthly average expenditure between 1001 and 2000 birr, as well as those with expenditures greater than 2000 birr, had the highest AORs for membership in Class 4 (both substance users and alcohol consumers), with AORs of 4.89 (95% CI 1.33-18.01) and 7.96 (95% CI 1.69-37.54), respectively, compared to students with expenditures of 1000 birr or less. In addition, students who had a monthly average expenditure of 1001 to 2000 birr had a higher AOR (2.79, 95% CI 1.32-5.88) for membership in class 3 (substance users) than students who had a monthly expenditure of less than or equal to 1000 birr. Students who had not engaged in early sexual activity had a lower AOR (0.41, 95% CI 0.21–0.79) for membership in class 3 (substance users) compared to those who had early sexual debut (Table 12).

Table 12: Adjusted multinomial logistic regression results for factors associated with latent class membership among undergraduate students at six universities in Ethiopia (N = 523)

Model for Classes Covariates	Class 2 OR (95% CI)	Class 3 OR (95% CI)	Class 4 OR (95% CI)	Overall p-value
Age				
18 to20 years	1	1	1	
21 to 24 years	1.89 (0.93-3.86)	1.59 (0.80-3.16)	0.77 (0.33-1.79)	
> 25 years o	1.58 (0.53-4.74)	1.15 (0.35-3.79)	0.38(0.09-1.62)	0.36
Sex				
Female	1	1	1	
Male	0.63 (0.35-1.11)	1.05 (0.55-2.02)	0.81 (0.35-1.90)	0.32
Relationship status				
Not in relationship	1	1	1	
In relationship	0.96 (0.58-1.58)	0.93 (0.50-1.72)	2.06 (0.90-4.71)	0.36
Residence before coming to the university				
Rural	1	1	1	
Urban	0.92 (0.49-1.72)	0.44 (0.24-0.84)*	0.33 (0.14-0.76)*	0.012
Year of study				
Second-year student	1	1	1	
Third-year student	1.02 (0.62-1.68)	0.86 (0.48-1.52)	0.99 (0.42-2.34)	0.94
Living status on campus				
On campus	1	1	1	
Off-campus	1.67 (0.82-3.40)	1.05 (0.42-2.62)	0.51 (0.11-2.41)	0.36
Living conditions while attending secondary school				
At home	1	1	1	
Away from home	1.00 (0.53-1.86)	1.41 (0.74-2.69)	0.38 (0.12-1.21)	0.21
Monthly average expenditure				
<1000 birr(<20$)	1	1	1	
1001-2000 birr (20-40)	0.96 (0.48-1.91)	2.79 (1.32-5.88)*	4.89 (1.33-18.01)*	
> 2000 birr (40$)	1.21 (0.48-3.03)	1.46 (0.47-4.51)	7.96 (1.69-37.54)*	0.013
Number of sexual partners in the last 12 months				
More than one	1	1	1	
One	1.61 (0.88-2.95)	1.18 (0.63-2.20)	0.92 (0.36-2.33)	0.47
Inconsistent condom use				
Yes	1	1	1	
No	1.27 (0.74-2.19)	0.91 (0.47-1.76)	0.86 (0.36-2.05)	0.69
Early sexual debut				
Yes	1	1	1	
No	0.64 (0.34-1.20)	0.41 (0.21-0.79)*	0.50 (0.20-1.23)	0.055
Ever had HIV test				
Yes	1	1	1	
No	0.61 (0.37-1.01)	1.13 (0.64-1.99)	1.13 (0.52-2.47)	0.12
Sexual violence experience in the last 12 months				
Yes	1	1	1	
No	0.98 (0.44-2.17)	1.15 (0.43-3.06)	0.89 (0.26-3.06)	0.98

*P-value<0.05

Discussion

General discussion

The overall aim of this thesis was to examine the prevalence of risky sexual behavior, exposure to violence, and associated lifestyle factors among university students in Ethiopia. Furthermore, this thesis identified distinctive patterns of substance use and alcohol consumption and factors associated with these patterns. Such knowledge may contribute to evidence-based initiatives for the targeted prevention and management of risky sexual behaviors, violence exposure, and other risky behaviors such as substance and alcohol use among university students.

This thesis explored the prevalence of RSB using a stringent definition, specifically, students having both more than one sexual partner and inconsistent condom use. By applying this rigorous criterion, the study aimed to identify university students at the highest risk of negative sexual and reproductive health outcomes, ensuring a more precise assessment of vulnerability within this population. Furthermore, the identification of those at the highest risk is helpful for targeted intervention and the effective use of resources, which can be especially strategic in resource limited countries like Ethiopia. The results showed that 19.5% of the students had engaged in RSB in the last 12 months and factors such as age, age at the start of sex (10–17 years), and having experienced emotional violence in the last 12 months were significantly associated with risky sexual behavior. Furthermore, the overall prevalence of violence exposure (those who experienced at least one type of violence) in the past 12 months was 17.6%. Factors significantly associated with violence exposure included being older than 25 years, being in a relationship, coming from a rural residence, studying at a first-generation university, consuming alcohol at least once a week, chewing khat, and using other drugs. This thesis also identified four distinct classes of substance use and alcohol consumption: Class 1 (non-users), Class 2 (alcohol consumers), Class 3 (substance users), and Class 4 (both substance and alcohol users). Factors such as residence before coming to the university, monthly average expenditure, and early sexual debut were found to be significantly associated with class membership.

University students are vulnerable to different risky behaviors due to the new environment, being away from parental supervision, increased opportunities for independence and self-decision, and peer pressure. Furthermore, there are multiple factors that expose university students to RSB, violence, and substance and alcohol

use. According to Bronfenbrenner's ecological model, individual vulnerability to risky behavior is a product of interaction with factors at various systemic levels including group processes, institutional, community, public policy, and societal factors.

Age is one of the individual-level factors that significantly influences RSB among university students. In the present study, students aged 21–24 years were less likely to engage in RSB compared to those aged 25 and above. This finding aligns with previous studies conducted among university students, as well as among youth attending reproductive health clinics, in Ethiopia (25,116), and among ethnically diverse university students in the United States (117). Several factors may explain this association. Older university students are more likely to engage in behaviors associated with increased risk, such as alcohol consumption and drug use (118,119), which have been strongly linked to unsafe sexual practices. Additionally, as students advance in age, they often gain greater autonomy and independence, which may lead to increased experimentation with sexual activity. Social influences also play a role, where older students may experience peer pressure or societal expectations to engage in behaviors perceived as typical for their age group, such as having multiple sexual partners or participating in casual sex. Furthermore, academic stress and relationship challenges may push some students toward risky coping mechanisms (120), including unprotected sex. Despite their age, many university students may still lack comprehensive sexual health knowledge or face barriers in accessing essential reproductive health services, such as contraception and STI testing (121). These factors collectively contribute to the heightened engagement in RSB observed among older students in this study. Therefore, implementing age-specific interventions for students already engaged in RSB, and preventive educational programs for those not yet engaged, could be vital.

Early debut of sexual activity has numerous negative health consequences, primarily increasing the risk of STIs including HIV/AIDS (122) due to factors like inconsistent condom use and having multiple sexual partners over time. Findings from this thesis indicated that students who began sexual activity between the ages of 10 and 17 had significantly higher odds of engaging in RSB. This result was similar to previous studies, including a study conducted among university students in Ethiopia (26), a population-based study in Zambia involving sexually active female adolescents aged 15–19 years (123), and a study in China among college students, which found that individuals with an early sexual debut had increased odds of engaging in condom-less sex during their most recent sexual encounter (124). Additionally, a study on university students in China reported that those who initiated sexual activity at a younger age were more likely to have multiple sexual partners in their lifetime compared to those who delayed their first sexual experience (125). This could be due to the longer duration of sexual experience, which increases the likelihood of exposure to risky behaviors. Moreover, individuals who initiate sex early may be less likely to use preventive measures such as consistent condom

use and safer sexual practices (26,125). Given these findings, comprehensive sexuality education is strongly recommended. Such programs should target both sexually active and non-sexually active individuals, with a focus on promoting safer sexual behaviors, including abstinence and proper condom use. By equipping young people with the necessary knowledge and skills, these interventions can help mitigate the risks associated with early sexual initiation and foster healthier sexual behaviors over time.

Another factor significantly associated with RSB was exposure to violence. Violence, particularly emotional abuse, can have profound psychological effects, often leading individuals to adopt risky coping mechanisms such as alcohol consumption, drug use, or unprotected sexual activity (126). The current study indicated that students who experienced emotional violence had a significantly higher risk of engaging in RSB compared to those without such experience. A previous study conducted among high school students in Rwanda revealed a strong association between RSB and experiences of domestic violence (20). Similarly, a multi-country study involving university students from 25 nations across Africa, the Americas, and Asia found that exposure to emotional violence was significantly linked to addictive behaviors and other forms of high-risk conduct (127). Beyond its direct behavioral consequences, emotional abuse can also have a detrimental impact on an individual's self-esteem, leading to feelings of worthlessness and diminished self-worth (128). Studies conducted in the United States and the Czech Republic have demonstrated that adolescents with low self-esteem were more likely to engage in risky sexual behaviors compared to those with higher self-confidence (129,130). Given this finding, it is crucial to implement targeted interventions to mitigate the impact of emotional violence among university students. Strategies such as building self-esteem and resilience, providing education on the prevention and management of emotional violence, and fostering strong support systems through immediate contacts such as friends, family, or professional counseling can play a vital role in addressing this issue effectively.

Furthermore, exposure to violence among university students is common, though its prevalence and nature vary depending on the type of violence and the context. This thesis demonstrated that exposure to violence was not limited to females; males were also significantly affected. This broader perspective challenges the commonly held assumption that violence is predominantly a female issue and underscores the need for inclusive prevention and intervention strategies that address both genders. Multiple factors contribute to students' exposure to violence, including individual characteristics, behavioral tendencies, and environmental influences. Among these factors, age was identified as a significant determinant of violence exposure. This thesis found that students over the age of 25 had higher odds of experiencing violence within the past 12 months compared to their younger peers. This finding was similar to a study conducted in Turkey of university students' exposure to emotional violence, which reported that the likelihood of experiencing emotional

violence increased with age (61). Similarly, a multi-country study conducted in Cambodia, Haiti, Kenya, Malawi, and Tanzania examined the effect of sex and age on violence experiences among adolescents aged 13 to 24 (131). The results indicated that the risk of both sexual violence and intimate partner violence increased as individuals grew older. One of the possible explanations for this association could be that older students may be more likely to engage in alcohol or substance use than their younger counterparts (132–134). Similarly, a study on alcohol-related mortality and morbidity among college students in the United States revealed that excessive alcohol consumption increases with age and is associated with violence experience among students (135). Substance use can impair judgment, reduce self-control, and increase vulnerability to violent situations.

Bronfenbrenner's ecological model highlights the profound influence of immediate social environments such as family dynamics, peer interactions, and intimate relationships on an individual's behavior (91,136). These social contexts can significantly shape one's risk of experiencing or perpetrating violence. Negative interactions within relationships, whether due to conflicts, misunderstandings, or power imbalances, can contribute to a cycle of aggression and reinforce patterns of violent behavior over time. In the current analysis, students who were in a relationship had higher odds of experiencing violence compared to their peers who were not in relationships. One possible explanation is that romantic partners tend to spend extended periods together, increasing the likelihood of conflicts and disagreements that, if not managed constructively, may escalate into violence. Additionally, emotional or financial dependency within relationships can make individuals more susceptible to manipulation, coercion, and abuse, further increasing their vulnerability to violence. Previous studies also established a significant association between relationship status and experiences of violence among university students. Studies conducted among female university students in Ethiopia found that being in a relationship was significantly associated with sexual violence (60,137). Similarly, gender-based violence (GBV) was significantly associated with relationship status among female students in Ethiopia (63,64), students at public universities in South Africa (65), and both male and female university students in the United States and Canada (14). Given that intimate relationships inherently involve close personal interactions, being in a relationship could increase the risk of experiencing various forms of intimate partner violence, including emotional, physical, and sexual violence perpetrated by a partner. Therefore, universities or stakeholders should implement targeted violence prevention programs that focus on students who are currently in relationships. These programs should include healthy relationship dynamics, communication skills, and recognizing early signs of abuse, to reduce the risk of violence among partnered students.

According to Bronfenbrenner's ecological model, broader social systems such as communities, neighborhoods, and cultural norms indirectly shape an individual's

development and experiences (86). These external influences can create environments that either protect against or increase the risk of exposure to violence. In the current study, students from rural backgrounds were more likely to experience violence compared to their urban counterparts. A study on sexual violence among female college students in Ethiopia found that rural residence was significantly associated with increased exposure to various forms of violence within academic settings (138). This could be due to students from rural areas being more vulnerable to teasing, bullying, and other forms of aggression, potentially because they are perceived as different or as outsiders within the university environment. Another study on structural family factors and bullying among adolescents in China found that students from rural backgrounds were more likely to experience bullying at school (139). This suggests that rural upbringing may, in some settings, be associated with social marginalization and an increased risk of violence. The intersection of rural background, socioeconomic factors, and social integration challenges may contribute to heightened vulnerability among students from rural areas.

In this thesis, frequent alcohol consumption was significantly associated with a higher likelihood of experiencing violence. Alcohol consumption impairs cognitive and physical functions, diminishing self-control and hindering one's ability to manage conflicts effectively and peacefully (140). Studies conducted in Ethiopia on sexual violence and gender-based violence (GBV) among female college and university students reported similar findings, indicating that students who frequently consume alcohol were significantly at higher risk of being victims of violence (62,63,141). A review of alcohol consumption among college students found that those who engaged in frequent binge drinking, defined as consuming excessive amounts of alcohol at least three times within two weeks, were particularly vulnerable to negative outcomes, including violence, accidents, and risky sexual behaviors (142). Being a college or university student may create a special risk for young adults, as academic institutions often provide an environment where alcohol is more accessible and widely accepted. This increased availability and acceptance of alcohol use can lead to unintended consequences, such as heightened vulnerability to physical and sexual assaults (143). As alcohol consumption continues to be a common feature of student life, its role in exacerbating violence exposure among university students remains a critical public health concern.

In the present study, students who used khat and other drugs had higher odds of experiencing violence. Similarly, studies among female college and university students in Ethiopia have shown a significant association between khat use and GBV (59,137,144). A study conducted in India among college students also found an association between substance use and violence exposure (66). Likewise, a study in the United States reported that physical violence was significantly associated with illicit drug use (145). The relationship between substance use and violence is

complex, as alcohol and drugs are often used as coping mechanisms following traumatic events, including experiences of violence (146,147).

To mitigate violence related to risky behaviors, universities could adopt a comprehensive approach. This may include the implementation of comprehensive alcohol and substance use education programs that highlight the risks associated with their use, particularly in relation to violence, and providing accessible counseling services for students struggling with substance use (148,149). Efforts should also be made to promote alcohol- and substance-free social events and venues, such as coffee houses. Additionally, universities should develop and enforce clear policies such as collaborating with local businesses to restrict the availability of alcohol and substances near campus and setting limits on consumption (150,151). Appropriate disciplinary measures should also be in place for students who engage in risky behaviors related to alcohol and substance use. Addressing contributing factors at the individual, relational, community, and societal level is also suggested by Bronfenbrenner's ecological model for effective prevention and intervention strategies specifically tailored to the needs of university students.

This thesis examined patterns of substance and alcohol use and identified factors associated with class membership among sexually active students. The study was able to identify subgroups of individuals who are at higher risk of engaging in multiple risk behaviors such as risky sexual behaviors and substance and alcohol use. These students are consequently more vulnerable to adverse sexual and reproductive health outcomes, such as STIs including HIV, unintended pregnancies, and unsafe abortions. This thesis found that students who delayed sexual debut were significantly less likely to belong to Class 3, characterized by high levels of substance use, compared to those who experienced early sexual debut. Similarly, studies showed a strong association between early sexual debut and increased substance use, including alcohol and other psychoactive substances. For instance, a study among high school students in Colombia (152), studies in Brazil, Spain, and several meta-analyses among adolescents and young adults reported that early sexual debut was associated with risky behaviors, including substance use (82,153–155). The association between early sexual debut and substance use could be a combination of individual, peer, developmental, and environmental influences. Young adults who engage in sexual activity at a younger age are more likely to experiment with alcohol and drugs, often within social contexts that normalize or encourage such behaviors (156). Furthermore, early initiation of sexual activity is associated with several negative health outcomes, such as having multiple sexual partners, inconsistent condom use, increased rates of STIs (122), and higher levels of alcohol and drug use (154,157).

Another factor that was significantly associated with class membership was the students' previous place of residence. Specifically, students who had resided in rural areas prior to university enrollment were more likely to be classified into Class 3

(substance users) and Class 4 (both substance and alcohol users). This suggests that rural background may be a contributing factor to increased vulnerability to substance and alcohol use during university life. Several factors may contribute to this association. Students from rural areas often face substantial challenges when transitioning to university settings; these may include adjusting to a new university environment and coping with academic pressures. In such contexts, some students may turn to alcohol and other substances as coping mechanisms to manage stress, anxiety, or feelings of social isolation. Additionally, exposure to peer groups where substance use is normalized can further reinforce these behaviors. A study conducted in the United States revealed that college students from rural backgrounds entered into a higher education with lower initial levels of alcohol and marijuana use compared to their urban peers. However, this apparent protective effect tends to erode over time, as rural students are increasingly influenced by the prevailing norms and behaviors of the college environment, particularly those related to substance use. As a result, their patterns of alcohol and drug use begin to reflect those of their urban counterparts (158). Similar findings have been reported in other contexts. For instance, studies from Cameroon (159) and Ethiopia (80,160) have shown that students from rural backgrounds are more susceptible to adopting risky behaviors, including substance use. These findings were supported by Bronfenbrenner ecological model that underscore the powerful role of environmental and social influences in shaping students' behavior. Hence, the current study highlights the need for targeted interventions to support students, particularly those from rural areas, as they adjust to university life.

Furthermore, this study also indicated a significant association between students' monthly expenditures and class membership, particularly with Class 4 comprising students who engage in both substance use and alcohol consumption. Students with higher monthly spending were more likely to fall into this category, suggesting that greater financial resources may increase the likelihood of engaging in multiple risk behaviors. These findings was similar with a study conducted among college students in the United States, which found that students with greater financial means were more likely to engage in heavy drinking and experience alcohol-related negative consequences (161). Similarly, other studies revealed that financial capability plays a crucial role in facilitating access to substances, especially in social settings that encourage such behaviors (80,81). The association between higher expenditure and increased substance use highlights the importance of considering economic factors when designing interventions aimed at reducing harmful behaviors among university students. It also points to the need for awareness-raising efforts that address not only peer influence and social norms but also how financial resources can enable or reinforce risk-taking behaviors.

Methodological considerations

This thesis has several strengths. To the best of our knowledge, this is the first national survey in Ethiopia that involved multiple institutions, i.e., six universities, whereas previous studies were typically limited to a single university. Each participating university contributed its own sample, which collectively provided broad coverage of undergraduate students across the country. Although first-year, fourth- and fifth-year students were intentionally excluded from the sample, the study is generalizable to the wider group of undergraduate students in Ethiopia. However, the findings may have limited generalizability to university students in other countries due to variations in cultural and socio-economic background.

One of the unique strengths of this thesis is its inclusive approach to gender, particularly in relation to exposure to violence. Unlike most previous studies in Ethiopia that have predominantly focused on female students or women, this research included both male and female students, providing a more comprehensive understanding of violence experience.

The HIV testing of students was done using the national testing algorithm to identify those who acquired HIV/AIDS. A comprehensive and structured questionnaire was employed. This allows for a holistic understanding of the factors influencing students' risky behaviors and experiences. Additionally, it helps to identify high-risk behaviors and vulnerable groups, crucial for designing targeted, effective prevention and intervention strategies. A pilot study was conducted prior to the main data collection phase to ensure that the questionnaire was contextually appropriate and understandable for the target population.

Administering the questionnaire in classroom settings may have contributed to the high response rate (94.4%), which is another significant strength of the study. To minimize selection bias, both universities and academic departments were randomly selected. Furthermore, multivariable statistical analyses were used to control for potential confounders. Notably, this study is, to our knowledge, the first in the Ethiopian context to apply latent class analysis (LCA) to identify distinct patterns of substance use and alcohol consumption among university students.

Despite these strengths, the study also has certain limitations. As the questionnaire was self-administered, there might be incomplete or inaccurate data, as well as underreporting and overreporting of data due to various factors. To address this, respondents received clear instructions and an orientation on how to complete the questionnaire prior to participation. The sensitive nature of some questions, for example, questions related to sexual behavior, excessive substance use including alcohol, and violence exposure, could have introduced social desirability bias; however, this risk was mitigated through the use of anonymous questionnaires and by ensuring that data collection facilitators were external to the universities. Furthermore, after the questionnaire was completed, the students left it in the box

that was prepared for questionnaire collection, which helped to protect confidentiality and reduce response bias.

Another inherent limitation lies in the cross-sectional design of the study, which precludes the establishment of causal relationships between risk factors and outcome variables such as RSB, violence exposure and different latent classes. Furthermore, while the study applied a stringent definition of risky sexual behavior, which might have limited the identification of students engaging in any type of RSB, it allowed for more precise targeting of those at higher risk, potentially enhancing the effectiveness of interventions.

Finally, although some items in the questionnaire had missing responses, there was no observable systematic pattern to the missing data. Therefore, it was assumed that the missingness was random and unlikely to bias the study results.

Implications for future research

This thesis provides a comprehensive understanding of the prevalence of and factors associated with risky sexual behavior and violence exposure among university students in Ethiopia, as well as patterns of substance and alcohol use. The findings provide valuable insights that can inform the development of targeted interventions aimed at mitigating these issues within higher education settings.

However, future research should consider employing qualitative study designs to explore the underlying perceptions and experiences related to RSB, violence exposure, and substance and alcohol use. Including diverse perspectives such as those of students, student club members (e.g., HIV/AIDS clubs), lecturers, university administrators, and other relevant stakeholders would allow for a more nuanced understanding of students' vulnerabilities. This approach could uncover underlying vulnerabilities and social dynamics that are not easily captured through quantitative methods, thereby supporting the design of more effective prevention and response strategies.

While this thesis addressed violence exposure among both male and female students, future research would benefit from including the gender of perpetrators to enhance the contextual understanding of violence dynamics. Additionally, future studies should explore effective approaches for raising awareness of sexual and reproductive health, potentially by evaluating and integrating such topics into the current university curriculum.

Moreover, an assessment of existing institutional policies and regulatory frameworks concerning both perpetrators of violence and individuals engaging in risky behaviors is crucial. Such evaluations will not only identify policy gaps but also guide the development of comprehensive, evidence-based policies that promote a safer and healthier university environment.

Conclusion

Risky sexual behavior, violence exposure, and substance and alcohol use are public health concerns among university students in Ethiopia. This thesis highlights that students' vulnerability to RSB, violence, and other risky behaviors is influenced by a complex interplay of individual, behavioral, social, and environmental factors. These interconnected determinants collectively contribute to increased exposure and susceptibility to such risks.

Through advanced analytical approaches, distinct subgroups of students were identified based on their patterns of substance and alcohol use. The analysis further revealed that socio-demographic and behavioral characteristics significantly influence students' likelihood of belonging to these subgroups, underscoring the importance of considering student heterogeneity in designing interventions.

Overall, the findings of this thesis offer important evidence that can serve as a foundation for designing targeted, evidence-based interventions to prevent and address RSB, violence, and patterns of substance and alcohol use among university students in Ethiopia. By understanding the multifaceted nature of student vulnerability, stakeholders can implement more effective strategies to promote student safety, health, and academic success.

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Appendix

Appendix I: Structured questionnaire

Participant ID_____

Section 1: Background Characteristics

Q#	Questions	Coding Categories	Skip to
1.	What is your sex?	1. Male 2. Female	
2.	What is your age in years (completed years)	_____ Years.	
3.	What religion are you?	1. Orthodox 2. Catholic 3. Protestant 4. Muslim 5. Other (specify)_____	
4.	What is the name of your University?	1. Hawasa University 2. Bahir Dar University 3. Adama University 4. Addis Ababa University 5. Dire Dawa University 6. Ambo University	
5.	In which faculty do you study?	1.Faculty of Natural and computational science 2.Faculty of Medicine 3.Faculty of Social and Human Science 4.Faculty of Law 5.Faculty of Business and Economics 6.Faculty of Institute of Technology 7.Other, specify_____	
6.	In which department do you study?	_____	
7.	What is your year of study	1. First year student 2. Second year student 3. Third year student 4. Fourth year student 5. Fifth year student 6. Sixth year student	
8.	Where do you live?	1. On campus 2. Off campus	
9.	Are you currently married?	1. Yes 2. No, and I have never been married 3. No, I am divorced 4. Cohabiting/living together 5. Separated 6. Widowed	If your answer is "yes", go to Q# 11
10.	If your answer is no/ divorced/ separated/ widowed, are you currently in a relationship?	1. Yes 2. No	

11.	Which region do you come from?	1. Amhara 2. Afar 3. Tigray 4. Oromia 5. Somali 6. Benshagul 7. SNNPR 8. Harari 9. Dire Dawa 10. Gambela 11. Addis Ababa 12. Sidama	
12.	Where did you live/area of origin before coming to the University?	1. Urban, please specify the town_____ 2. Rural, please specify the place _____	
13.	If your answered is urban town, which level of town did you live in?	1. Addis Ababa 2. Regional town 3. Zonal town 4. Woreda town 5. Other, specify_____	
14.	Did you mostly live at home or away from home while attending secondary school?	1. At home 2. Away from home	
15.	Who pays for most of your expenses while you are in the university? (select one)	1. Parent 2. Relative 3. Girlfriend 4. Boyfriend 5. Sugar daddy/mummy 6. Scholarship/sponsorship by the university 7. Myself, though work 8. Other(specify) _____	
16.	How much do you spend per month on average in birr?		

Section 2: Knowledge on HIV/AIDS

Q#	Questions	Coding Categories	Skip to
1.	Have you heard of HIV or AIDS?	1. Yes 2. No	If your answer is "No", go to Section 4 Q# 1
2.	If yes, from where did you get the information about HIV/AIDS? **(multiple answer is possible)**	1. My parents 2. Sexual partner 3. Friends 4. Health institution 5. Teachers 6. Religious leaders 7. Newspapers, posters or pamphlets 8. Radio 9. Your university 10. Others, specify_____	
3.	Can a person reduce their risk of getting HIV by using a condom every time they have sex?	1. Yes 2. No 8. I don't know	
4.	Can a person reduce their chance of getting HIV by limiting sexual intercourse to one uninfected partner?	1. Yes 2. No 8. I don't know	
5.	Is it possible for a healthy-looking person to have HIV?	1. Yes 2. No 8. I don't know	
6.	Can a person get HIV from a mosquito bites?	1. Yes 2. No 8. I don't know	

7.	Can a person get HIV by sharing food with a person who has HIV?	1. Yes 8. I don't know 2. No	
8.	Can HIV be transmitted from a mother to her baby: During pregnancy? During delivery? By breast feeding? (**more than one response is possible**)	Yes No I don't know During pregnancy----1 2 8 During delivery------ 1 2 8 By breast feeding----1 2 8	
9.	Can the risk of Mother to Child Transmission be reduced by the mother taking antiretroviral (ARVs) drugs?	1. Yes 8. I don't know 2. No	
10.	Can a person get HIV through injections with a needle that has been used by someone who has HIV?	1. Yes 8. I don't know 2. No	
11.	Can a person get HIV through by shaking hands with someone who has HIV?	1. Yes 8. I don't know 2. No	
12.	Can HIV be cured?	1. Yes 8. I don't know 2. No	
13.	Can treatment (antiretroviral) lowers the risk of HIV transmission from a person living with HIV?	1. Yes 8. I don't kno 2. No	

Section 3: Attitude towards HIV/AIDS

Now I would like to ask you some questions about your attitude towards HIV/AIDS transmission. Please remember that your response is confidential so be truthful in your answers.

Q#	Questions	Coding Categories
1.	If one of your family members was infected with HIV would you be willing to care for him/her?	1. Yes 2. No
2.	If you were infected with HIV would you prefer this information to remain a secret?	1. Yes 2. No
3.	Would you eat from the same plate as a person you know has HIV/AIDS?	1. Yes 2. No
4.	Would you attend the same class at school/university as someone who you know has HIV?	1. Yes 2. No
5.	If a professor has HIV should he/she be allowed to continue to teach at the school/university?	1. Yes 2. No
6.	If a health worker (doctor, nurse, etc) has HIV should he/she be allowed to continue to work with patients?	1. Yes 2. No
7.	If you know a food seller who has HIV, would you buy from him/her?	1. Yes 2. No
8.	Should students infected with HIV/AIDS have separate washing and toilet facilities at school/university?	1. Yes 2. No

Section 4: Sexual History, Self-Perception and Behavior

Q#	Questions	Coding Categories	Skip to
	Sexual history		
1.	Have you ever had sex? With sex we mean vaginal, anal or oral intercourse (**more than one response is possible**)	1. Yes, vaginal sex 2. Yes, anal sex 3. Yes, oral sex 4. No	If your answer is "No", go to Q# 13
2.	If yes, at what age did you first have sex?	_____ Years. (If your response is more than one please write the age for each)	
3.	With whom did you first have sex?	1. Boyfriend/girlfriend 4. Business man/woman 2. Teacher/lecturer 5. Female/male sex worker 3. Husband/wife 6. Other(specify) _____	
4.	Have you had sex in the past 12 months? (**more than one response is possible**)	1. Yes, vaginal sex 2. Yes, anal sex 3. Yes, oral sex 4. No	
5.	In the past 12 months how many sexual partners have you had?	_____	
6.	Have you ever accepted money, gift or some other form of compensation as payment for sexual relations with someone?	1.Yes, in the last 12 months 3.No 2.Yes, before last 12 months	
	Condom use		
7.	Did you ever use condom?	1. Yes 2. Never used condom	If your answer is "Never used condom", go to Q# 13
8.	Did you use condom when you had sex for the first time?	1. Yes 2. No	
9.	Did you use condom for avoiding sexually transmitted infections in the last 12 months sexual intercourse?	1. Yes 2. No	
10.	Did you use condom for avoiding sexually transmitted infections on your latest occasion of sexual intercourse?	1. Yes 2. No	
11.	How often do you use a condom with a new sexual partner?	1. Always 3. Sometimes 2. Often 4. Never	
12.	If you did not use a condom, why not? **(**more than one response is possible**)**	1. Condom was not available 5. Embarrassed to buy 2. Being in a hurry to have sex 6. I trust my partner 3. Afraid of telling sexual partner to use condom 7. Decreases pleasure or satisfaction 4. Partner objection 8. Other, specify_____	
	HIV testing service		
13.	Have you ever had an HIV test?	1. Yes 2. No	If your answer is "No", go to Q# 17

14.	When was your most recent HIV test?	1.Within the past 3 months 2. Between 6 months and 1 year 3. Between 1-2 years 4. Between 2-3 years 5. More than 3 years ago 6. Other specify_____	
15.	Did you get the result of your test?	1. Yes 2. No	
16.	What was the result of the test?	1. Positive 2. Negative 3. Declined to answer	
17.	Have you visited your institution's student clinic?	1. Yes 2. No 9. No Response	
18.	If yes, what services did you use?	1. HIV/AIDS counseling and testing service (VCT, PIHTC) 2. Contraceptives 3. STI treatment 4. Information on how to avoid pregnancy 5. Other specify_____	
	Self-perception on acquiring HIV		
19.	In your opinion, what is your risk of contracting HIV? Choose a number from 0 to 4 on the scale to mark your answers.	0. I am not at risk 1. I am at low risk 2. I am somewhat at risk 3. I am at high risk 4. I am at very high risk	If your answer is "1 or 0", go to Q# 21
20.	If you chose 2, 3 and, 4 why? (more than one response is possible)	1. More than one sexual partners 2. Mistrust 3. I have had sex without a condom 4. I have had sex with a Sex Worker 5. I have been injured with contaminated sharp 6. Blood transfusion 7. Other specify_____	
21.	If you choose 0, and 1why? (more than one response is possible)	1. I have never had sex 2. I abstain from sex 3. I am faithful 4. I have one partner 5. I have protected sex 6. I have not shared injecti 7. I always use a condom 8.Others, specify_____	
Sexual Transmitted Infections (STI): the next questions focused on your experience on the sexually transmitted diseases			
22.	Have you heard about sexually transmitted infections (STIs)?	1. Yes 2. No	If your answer is "No", go to Q# 27
23.	Have you had STI test?	1. Yes, in the last 12 months 2. Yes, before the past 12 months 3. Never	If your answer is " Never ", go to Q# 27
24.	Have you had any STI confirmed through laboratory test?	1. Yes, in the past 12 months 2. Yes, before the past 12 months 3. Never	
25.	Have you received treatment?	1. Yes 2. No	
26.	Where were you tested for STIs?	1. University clinic 2. Public health facility 3. Private health facility 4. Pharmacy 5. Home remedy, Traditional or Self-treatment 6. Other, specify_____	
	Alcohol use		
27.	Have you ever consumed so much alcohol that you couldn't remember what happened the next day?	1. I do not drink alcohol 2. Yes, in the last 12 months 3. Yes, before last 12 months 4. No, didn't consume so much alcohol 5. I don't remember	If your answer is "I do not drink alcohol " go to Q# 33

28.	In the past month, how often have you consumed alcohol?	1. I do not drink alcohol 2. Less often than once every two weeks 3. Once every two weeks or more, but not every week. 4. Once a week or more, but not every day 5. Every day 6. Other specify _____	
29.	**For men only**: Have you ever consumed five or more standard drinks of alcohol on at least one occasion?	1. Never 2. Yes, before last 12 months 3. Yes, in the last 12 months 4. Yes, in the last one month 5. Yes, in the last one week	
30.	**For women only**: Have you ever consumed four or more standard drinks of alcohol on at least one occasion?	1.Never 2.Yes, before last 12 months 3.Yes, in the last 12 months 4. Yes, in the last one month 5. Yes, in the last one week	
31.	In the past month, have you had sex under the influence of alcohol?	1. Yes 2. No	
32.	Did you or your sexual partner(s) use a condom when having sex under the influence of alcohol?	1. Yes 2. No	
	Substance use		
33.	Have you ever used any of the following substance (drugs) or intoxicants other than alcohol? (more than one response is possible)	1. Khat 2. Ganja(Atsefaris) 3. Hashish 4. Cocaine 5. Inhaling solvents such as benzine or glue 6. Marijuana(cannabis) 7. Never used 8. Other specify_____	If your answer is "Never used" go to Q# 39
34.	Have you used any drugs or intoxicants other than alcohol, in the past 12 months?	1. Yes 2. No	
35.	If yes, please specify the substance (drug) you used most frequently? (more than one response is possible)	1. Khat 2. Ganja(Atsefaris) 3. Hashish 4. Cocaine 5. Inhaling solvents such as benzine or glue 6. Marijuana(cannabis) 7. Never used 8. Other specify_____	
36.	How often have you used the drugs or intoxicants during the past month?	1. I do not use drugs or intoxicant 2. Less often than once every two weeks 3. Once every two weeks or more, but not every week 4. Once a week or more, but not every day 5. Every day 6. Other specify_____	
37.	Have you had sex under the influence of drugs or intoxicants other than alcohol in the past month?	1. Yes 2. No	If your answer is "No", go to Q# 39
38.	Did you or your sexual partner(s) use a condom when having sex under the influence of drugs or intoxicants?	1 Yes 2. No	
39.	Some drugs are injected using a syringe. Have you injected drugs (not for medical treatment of illness) in the past 12 months?	1. Yes, in the last 12 months 2. Yes, before in last 12 months 3. Never	If your answer is "Never", go to Section 5 Q# 1
40.	If yes, please specify the name of injected drug	_____	

Section 5: Reproductive health

Q#	Questions	Coding Categories	Skip to
1.	Are you aware of modern contraceptive methods/methods of family planning?	1. Yes 2. No	If your answer is "No", go to Q# 9
2.	If "Yes", what is your source of information about modern contraceptive method? **(**more than one response is possible**)**	1. Public health sector 2. Private health sector 3. Your Institution/university 4. Mass media 5. Print media 6. Spouse 7. Friend 8. Relatives 9. Other specify __	
3.	What methods of family planning are you aware of**?** **(**more than one response is possible**)**	1. Pill 2. IUD 3. Injectable 4. Condom 5. Norplant 6. Diaphragm 7. Spermicides 8. Tubal ligation 9. Vasectomy 10. Rhythm Method ("sex during safe period") 11. Other specify _____	
4.	Have you or your partner ever used modern contraceptive method in the past?	1. Yes 2. No	If your answer is "No", go to Q# 8
5.	If "Yes" What was the method you or your partner used?	1. Pill 2. IUD 3. Injectable 4. Condom 5. Norplant 6. Diaphragm 7. Spermicides 8. Tubal ligation 9. Vasectomy 10. Rhythm Method ("sex during safe period" 11.Other specify_____	
6.	Do you or your partner currently use a modern contraceptive method?	1. Yes 2. No	
7.	If "Yes" which method do you or your partner use currently?	1. Pill 2. IUD 3. Injectable 4. Condom 5. Norplant 6. Diaphragm 7. Spermicides 8. Tubal ligation 9. Vasectomy 10. Rhythm Method ("sex during safe period" 11.Other specify_____	
8.	If you and your partner don't use contraception, what is the reason?	1. Not accessible 2. Too expensive 3. I am abstained 4. I don't think it is important 5. I couldn't get my preference 6. Didn't start sex 7. Others, specify_____	
9.	How can pregnancy be avoided? **(**more than one response is possible**)**	1. Abstaining from sex 2. Using a condom 3. The man withdrawing before ejaculation 4. Wash intimate parts immediately after sex 5. Taking the pill 6. Choosing safe days for having sex 7. Other specify_____ 88. Don't know	
10.	Have you had an unwanted pregnancy?	1. Yes 2. No	If the respondent is **male**, please go to Section 6 Q#1
11.	Have you aborted an unwanted pregnancy?	1. Yes 2. No	
12.	Have you ever visited the university/college clinic for abortions service?	1. Yes 2. No	

Section 6: Sexual violence

It sometimes happens that people are forced or drawn into sexual acts against their will. We now ask some questions on that subject. We will first ask whether you have ever been forced by violence or some other means into one or more of the sexual acts below.

Q #	Questions	Coding Categories	Skip to
1.	Have you ever been exposed to any of the following threats or threats of violence that were so dangerous or serious that they scared you? **(**more than one response is possible**)**	1. Say or do something to humiliate you in front of others 2. Threaten to hurt or harm you or someone close to you 3. Insult you or make you feel bad about yourself 4. Other , specify_____ 5. No	If your answer is "No", go to Q# 4
2.	Have you been exposed to any of the following threats, or threats of violence in the past 12 months that were so dangerous or serious that they scared you? **(**more than one response is possible**)**	1. Say or do something to humiliate you in front of others 2. Threaten to hurt or harm you or someone close to you 3. Insult you or make you feel bad about yourself 4. Other , specify_____ 5. No	
3.	The last time this has happened, what was your relationship to the perpetrator? If it was **more than one person**, what was your relationship to the person who initiated the violence the **most recent** time this happened? **Perpetrator** means someone who has committed a violent or harmful act.	1.Boyfriend/girlfriend 2.Teacher/lecturer 3.Other student/classmate 4.Husband/wife 5.Family member 6.Person unknown to me/ stranger 7.Other (specify) _____	
4.	Have you ever been a victim any of the following types of physical violence? **(**more than one response is possible**)**	1. Push you, shake you, or throw something at you 2. Slap you 3. Twist your arm or pull your hair 4. Punch you with his/her fist or with something that could hurt you 5. Kick you, drag you, or beat you up 6. Try to choke you or burn you on purpose 7. Threaten or attack you with a knife, gun, or any other weapon 8. Other, specify_____ 9. No	If your answer is "No", go to Q# 8
5.	Have you been a victim of any of the following physical violence at any time during the past 12 months? **(**more than one response is possible**)**	1. Push you, shake you, or throw something at you 2. Slap you 3. Twist your arm or pull your hair 4. Punch you with his/her fist or with something that could hurt you 5. Kick you, drag you, or beat you up 6. Try to choke you or burn you on purpose 7. Threaten or attack you with a knife, gun, or any other weapon 8. Other, specify_____ 9. No	

6.	The last time this has happened, what was your relationship to the perpetrator? If it was **more than one person**, what was your relationship with the person who initiated the violence the **most recent time** this happened?	1.Boyfriend/girlfriend 2.Teacher/lecturer 3.Other student/classmate 4.Husband/wife 5.Family member 6.Person unknown to me/ stranger 7.Other (specify) _____	
7.	In the past 12 months, how many times has someone physically hurt you?	_____	
8.	Have you ever been raped or forced to have sex against your own will?	1. Yes 2. No	If your answer is "No", go to Q# 18
9.	In the past 12 months, have you been raped or forced to have sex against your will?	1. Yes 2. No	
10.	In the past 12 months, how many times has someone raped you or forced you to have sex against your will?	_____	
11.	The last time this has happened, what was your relationship to the perpetrator? If it was **more than one person**, what was your relationship with the person who initiated the violence the **most recent time** this happened?	1.Boyfriend/girlfriend 2.Teacher/lecturer 3.Other student/classmate 4.Husband/wife 5.Family member 6.Person unknown to me/ stranger 7.Other (specify) _____	
12.	What were the strategies used by **perpetrator**? **Perpetrator** means someone who has committed a violent or harmful act.	1.Made me drunk 2.Using authority(e.g teacher) 3.Threats of harm 4.Forced me to take a drug 5.Other, specify_____	
13.	Where were raped or forced to have sex?	1.Hotel 2.His/her home 3.My home 4.Dormitory 5.Other, specify_____	
14.	The last time you were raped or forced to have sex (raped) did you report it to a legal body?	1.Yes, to police 2.Yes, to gender office 3.Yes, to department head 4.Other specify__ 5.No, I didn't report	
15.	If the answer is no, what was your reason for not reporting it?	1. Legal body not helpful 2. Afraid of parents 3. Afraid of humiliation 4. Threatened by rapist 5. Other, specify_____	
16.	What other professional help or service did you seek out?	_____ 1. I didn't not try to seek professional help or services	
17.	What was the main reason that you did not try to seek professional help or services?	1. I did not know what services were available or where to access them 2. The services I wanted/needed were not available 3. I could not afford the services 4. I was uncomfortable accessing services 5. I did not feel that I needed services 6. Other , specify	
18.	Have you ever experienced psychological problems? Psychological problems includes experiences of psychological disorders such as fear/anxiety, self-hate and suicidal ideation	1. Yes 2. No	

Thank you very much!

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