TITLE: ANALYSING THE SOCIO-DEMOGRAPHIC DETERMINANTS OF COMPREHENSIVE HIV AND AIDS KNOWLEDGE AMONG SCHOOL-GOING CHILDREN IN BOTSWANA: A MULTI-LEVEL ANALYSIS

Mini – dissertation submitted to the Health Economics Division, School of Public Health, University of Cape Town, in partial fulfilment of the requirements for the degree of Master of Public Health specialising in Health Economics

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PART 0: PREAMBLE

Plagiarism declaration

I, Shatho Joy Kgosi (Student Number GMMSHA001), hereby declare that the work on which this mini-dissertation is based on my original work (except where acknowledgements indicate otherwise) and that neither the whole work nor any part of it has been, is being, or is to be submitted for another degree in this or any other university.

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Dedication

This dissertation is first dedicated to my God, who, by His grace enabled me to participate in the programme despite all odds against it. I also dedicate it to my husband, Kgosi, and our children, my cheerleaders, who always pushed me not to give up and motivated me to get this degree.

Abstract

Background: Despite international efforts to contain transmission, the spread of HIV/AIDS remains a problem in some communities. Botswana is one of the countries in sub-Saharan Africa that is most affected by the pandemic and, similar to other countries, Botswana has a higher proportion of HIV-infected young people in comparison to other age groups. Various factors such as wealth disparity, treatment systems, gross domestic product per capita, corruption, religion, education, contraceptive use, and availability of antiretroviral drugs, have been identified as drivers of new HIV infections. Additionally, lack of comprehensive knowledge regarding HIV/AIDS has been cited as a factor in HIV/AIDS transmission. Therefore, tailored HIV prevention and educational interventions are advocated for reasons of efficiency and sustainability. To address knowledge gaps and promote positive and safe sexual behaviour, emphasis has also been placed on behaviour change programs, highlighting the importance of understanding key populations.

Objectives: This study sought to investigate the level of comprehensive HIV/AIDS knowledge among school-age children in Botswana as well as the determinants of this cohort's comprehensive knowledge of HIV/AIDS.

Methods

Setting

The data used in this analysis is from a survey that was conducted in 135 private and public schools in Botswana in the ten districts overseen by the Ministry of Basic Education. Data was collected between February and April 2015 (Ministry of Basic Education, 2016).

Study Design

The data used in this study is from the 2015 Botswana Youth Risk Behavioural and Biological Surveillance Survey (BYRBBSS-II). Stratified multistage sampling was used to select schools and classrooms for participation in the study (Ministry of Basic Education, 2016). The school was the primary sampling unit (first stage), while the classroom was the secondary sampling unit (second stage) (Ministry of Basic Education, 2016). First, the student population was stratified by school district, while schools were selected based on their enrolment size and a list of classes of each sampled school was organised by grade level (grade 8,9,10,11 and 12) (Ministry of Basic Education, 2016). Schools were selected using a

sampling frame derived from the 2014 master list of school enrolment data provided by the Ministry of Basic Education (MBE) (Ministry of Basic Education, 2016).

Study Population

Students were eligible to participate in the study if they regularly attended secondary school, were in grade 8 to 12, had permission from their parents or legal guardians to participate, and gave informed consent and assent (Ministry of Basic Education, 2016). Of a total of 9,590 students eligible to be included in the study, 7,564 (78.9%) provided informed consent or assent and agreed to participate in the survey (Ministry of Basic Education, 2016). The ages of survey participants ranged from 13 to 19 years for both males and females (Ministry of Basic Education, 2016)

Inclusion Criteria

Students who provide informed consent and assent were included in the study.

Exclusion Criteria

Those who did not provide informed consent or assent were not included in the study (Ministry of Basic Education, 2016). Schools where there were fewer than 20 students surveyed were also excluded.

Data Analysis

A multilevel mixed-effects logistic regression was used to identify predictors of comprehensive HIV/AIDS knowledge at individual, school, and regional levels.

Results: The overall prevalence of comprehensive HIV/AIDS knowledge was estimated at 58.6%, 95% CI: (57.4% - 59.7%). Female students had higher levels of HIV/AIDS knowledge than their male counterparts. Comprehensive HIV/AIDS knowledge was also positively associated with school grade level completion. Surprisingly, it was found that 13-14-year-olds had higher odds of comprehensive knowledge compared to 15-19-year-olds. In contrast, students in grades 9 to 12 had a higher likelihood of comprehensive knowledge than those in grade 8. The odds of possessing comprehensive knowledge about HIV/AIDS were higher among private school students than among those attending public schools, while students identifying as Christian, demonstrated higher odds than those identifying as belonging to other religions or non-religious. Students who experienced hunger (as a proxy of socioeconomic status) were typically less informed than those who did not experience hunger, and those who resided with their parents

during school holidays were more likely to be well-informed compared to those who did not reside with their parents.

Conclusion: This study highlights that comprehensive knowledge of HIV/AIDS among students is still quite limited. It also highlights the role of school type, age, grade, and religion as key determinants of comprehensive knowledge of HIV/AIDS. Therefore, any meaningful policy to improve adolescents' knowledge of HIV/AIDS should consider the gaps associated with these determinants. The developed guidelines should aim to disseminate the latest and most relevant HIV/AIDS promotional messages in both private and public schools. In addition, while not neglecting Christians, extra efforts should be made to disseminate HIV/AIDS messages to young people who are non-Christian.

What this study adds: this study highlights the importance of comprehensive HIV/AIDS knowledge as an avenue for fighting the pandemic over and above biomedical interventions. Thus, the results of this study should guide programme development on topics that influence young people's understanding of HIV/AIDS to change behaviour. In addition, compared to the previous studies conducted on this topic, by using a multi-level analysis, this study was able to account for intra-cluster correlations in ascertaining the determinants of comprehensive HIV/AIDS knowledge, an innovation that was hitherto lacking in the literature on Botswana.

Keywords: Botswana, knowledge, awareness, HIV/AIDS, adolescents, young people

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List of acronyms

ABYM	Adolescent boys and young men
AGYW	Adolescent girls and young women
AIDS	Acquired Immunodeficiency Syndrome
ART	Antiretroviral therapy
ARV	Antiretroviral
AYP	Adolescents and young people
BAIS	Botswana AIDS Impact Survey
BYRBBSS	Botswana Youth Risk Behavioural and Biological Surveillance Survey
CBT	Cognitive behavioural theory
CD4	Cluster of differentiation 4
DREAMS	Determined, Resilient, Empowered, AIDS-free, Mentored, and Safe
DHS	Demographic and Health Survey
GBV	Gender-Based Violence
GoB	Government of Botswana
GRIDS	Gay-Related Immune Deficiency Syndrome
HIV	Human Immunodeficiency Virus
HIV-KQ	HIV Knowledge Questionnaire
HTS	HIV Testing Services
LMICs	Low- and middle-income countries
MBE	Ministry of Basic Education

MSM	Men who have sex with men
MTP	Medium-Term Plan
NGO	Non-Government Organisation
NIH	National Institutes of Health
NSF	National Strategic Framework for HIV/AIDS
PEPFAR	President's Emergency Plan for AIDS Relief
PLWHA	People living with HIV/AIDS
PMTCT	Prevention of mother-to-child transmission
PrEP	Pre-exposure prophylaxis
SDGs	Sustainable Development Goals
SRH	Sexual and Reproductive Health
SSA	Sub-Saharan Africa
STDs	Sexually transmitted diseases
TB	Tuberculosis
TGF	The Global Fund
UNAIDS	United Nations Programme on HIV/AIDS
UNDP	United Nations Development Programme
UNGASS	United Nations General Assembly Special Session
UNICEF	United Nations Children’s Fund
VMMC	Voluntary medical male circumcision

PART A- PROTOCOL

Introduction

Background to the study

The Human Immunodeficiency Virus (HIV), which causes Acquired Immunodeficiency Syndrome (AIDS), was first discovered in 1981 by scientists at the US Centres for Disease Control and Prevention (Friedland & Klein, 1987). It was discovered that in the absence of treatment, an advanced stage of HIV infection would result in AIDS (Friedland & Klein, 1987; World Health Organisation, 2022). Due to its concentration in the homosexual community in the 1980s, the disease was given the moniker Gay-Related Immune Deficiency Syndrome (GRIDS) (Liston, 2018). However, as further information about the illness became available, it became evident that self-injecting drug users, blood donors, newborn babies born to infected mothers, and heterosexual partners of HIV/AIDS patients were also susceptible to the illness (Friedland & Klein, 1987). GRIDS was renamed AIDS in response to this new information (Liston, 2018).

Modes of HIV transmission have evolved over the years due to changes in risk perception, behaviour and prevention efforts (UNAIDS, 2021). Although heterosexual transmission has historically been the most common transmission of the virus, there has been an increase in infection rates among men who have sex with men (MSM), particularly in the Global North (World Health Organization, 2020). In addition, various interventions in the Global North, other most vulnerable populations, needle exchange programs, and prevention of mother-to-child transmission (PMTCT) have led to declines in infections in the population (CDC, 2003). However, Sub-Saharan Africa (SSA) remains the region with the highest burden and heterosexual transmission remains dominant (UNAIDS, 2021). Compared to the Global North, transmission in SSA is driven by cultural and religious beliefs as well as a lack of infrastructure and education (Nubed & Akoachere, 2016; von Rosen et al., 2018)

Botswana has been stated to have one of the highest prevalence rates (NACA, 2019). Furthermore, heterosexual transmission has been the predominant route of transmission, but the country has made significant progress in reducing mother-to-child transmission (Government of Botswana, 2019). In addition, there has been an increase in new infections among young people, more specifically adolescents and young girls and older man (Government of Botswana, 2019). The main reasons for the discrepancies in Botswana are attributed to cultural norms, multiple partners, stigma and discrimination (Letamo, 2019).

The HIV/AIDS pandemic is one of the worst tragedies in modern history because of its extensive effects on both economic growth and public health. According to reports, over 60 million people have contracted HIV/AIDS in the past 20 years, posing serious obstacles to long-term human development, especially in developing nations (Thomson et al., 2016). For example, between 1996 and 1997, an estimated 3.2 million infections occurred worldwide on average (UNAIDS, 2023). Additionally, the highest HIV/AIDS mortality rates were recorded worldwide in 2004, with 2 million deaths (UNAIDS, 2022a). Unfortunately, low- and middle-income countries (LMICs), particularly in sub-Saharan Africa (SSA), continue to experience the most severe outcomes related to HIV/AIDS mortality and new infections (Alhasawi et al., 2019). In 2021, the United Nations Programme on HIV/AIDS (UNAIDS) estimated 1.5 million new infections globally, with 57% of these cases occurring in Africa (UNAIDS, 2022b). Furthermore, in the same year, it was estimated that 64.6% of the 650,000 HIV/AIDS deaths worldwide came from Africa (UNAIDS, 2023).

Botswana is one of the countries in Sub-Saharan Africa (SSA) that has been severely impacted by the HIV/AIDS pandemic. In 1985, the first case of HIV was discovered in Botswana, and by the mid-1990s, the epidemic had spread throughout the country (NACA, 2019). During the peak of the HIV/AIDS pandemic in Botswana, the United Nations Development Programme (UNDP) estimated that 100 new infections were occurring daily in 1997, and by the year 2000, about 270,000 would be living with the disease (Farrow, 1999; Phaladze & Tlou, 2006). Such statistics would make HIV/AIDS a significant problem for Botswana's 1.5 million residents (Farrow, 1999; MacFarlan & Sgherri, 2001; Phaladze & Tlou, 2006).

In 2020, Botswana was still among the four most HIV and AIDS-affected countries in the SSA region, behind South Africa, Eswatini and Lesotho (Government of Botswana, 2019). In 2021, according to UNAIDS statistics for Botswana, 15% of the population was HIV positive, while estimated figures in Eswatini, South Africa and Lesotho were 19%, 13% and 13%, respectively (UNAIDS, 2021). According to their estimates, 7,200 new infections and 4,600 AIDS-related deaths were also recorded in the same year in Botswana (Government of Botswana, 2019; UNAIDS, 2021).

In the global HIV/AIDS debates, various authors have attributed biological, socioeconomic and demographic factors for increased HIV/AIDS incidences (Nubed & Akoachere, 2016; von Rosen et al., 2018). The determinants cited in various studies as driving the increase in infection rates included wealth disparities, type of treatment systems, gross domestic product per capita,

corruption, religion, education, contraceptive use, and the unavailability of antiretroviral drugs (Nubed & Akoachere, 2016; von Rosen et al., 2018). Against this background, numerous initiatives have been developed to combat the spread of HIV/AIDS (Govender et al., 2018). As a result, HIV-related mortality has declined worldwide, particularly in SSA (Govender et al., 2018; Zegeye et al., 2022).

Problem statement

For effective HIV/AIDS prevention, care and support, it is important to understand and address the causes of new HIV infections. Despite various measures implemented to combat the increasing infection rate, new cases continue to emerge (UNAIDS, 2019; World Health Organisation, 2022). Additionally, the latest BAIS results indicate that the adult population has surpassed the UNAIDS treatment targets and is currently at 95-98-98[3], while the country's achievement for young people aged 15-24 years, stands at 82-83-76, falling short of the current UNAIDS targets of 95-95-95 (Government of Botswana, 2019).

To ensure epidemic control by 2030, commitments were redirected to achieving the remaining 5-2-2 for total HIV/AIDS elimination in the population. To reach the remaining 5-2-2, young people within the cohort of 15-24years and key populations have been identified as priority populations where interventions need to be strengthened (Statistics Botswana, 2022). That is stipulated in the BAIS V findings, which indicate that new infections are concentrated on young people who account for 36% of new infections (Statistics Botswana, 2022). Furthermore, within this cohort, new infections are predominantly in young women, who make up 9% of the population and account for 24% of new infections (Government of Botswana, 2019).

Previous research has highlighted the growing concern about new infections among young people. According to data from UNAIDS, in 2018, it was estimated that 370,000 people were living with HIV in Botswana, and 29,500 were young people aged between 15-24 years. Notably, women accounted for more than half that number (Majelantle et al., 2014; NACA, 2019; UNICEF, 2017a). In the same year, three out of every ten new HIV infections in Botswana occurred among adolescents and young people aged 15-24 years and adolescent girls aged 10–19 years were three

[3] 95% of all people living with HIV will know their HIV status, 98% of all people with diagnosed HIV infection will receive sustained treatment, and 98% of all people receiving treatment will have viral load suppression.

times more likely to be infected than boys of the same age (NACA, 2019; Statistics Botswana, 2022; UNICEF, 2017b).

The increase in new infections among young people leads to gaps in the adolescent HIV care cascade, which includes HIV diagnosis, linkage to and retention in treatment, adherence to antiretroviral therapy (ART), and viral load suppression (Enane et al., 2018; Statistics Botswana, 2022). Testing restrictions for minors have become an impediment and have led to an aversion to testing (UNICEF, 2017a). These restrictions include parental or legal guardian consent being required before minors can get tested (Health, 1993). As a result, fewer persons are diagnosed with HIV, and those who are HIV positive often are not enrolled in ART programmes because they do not know their HIV status (UNICEF, 2017b). Consequently, there is no reliable data on the percentage of HIV-positive youth currently receiving antiretroviral therapy or data on their viral suppression (NACA, 2019).

Another crucial factor contributing to the increase in HIV/AIDS prevalence among the youth is young people's level of knowledge about HIV/AIDS (Majelantle et al., 2014). Despite extensive educational campaigns on HIV/AIDS education, school-aged youth in Botswana lack a clear understanding of HIV/AIDS, which promotes dangerous sexual behaviour. In 2008, only 43% of adolescents and young people (AYP) aged 15-24 years had a comprehensive understanding of HIV/AIDS (Majelantle et al., 2014). The 2018 UNAIDS evaluation in Botswana also confirmed this finding, concluding that less than half of adolescent women and teenage girls had a comprehensive understanding of HIV/AIDS-related concepts (UNAIDS, 2019). However, according to BAIS results, in 2021, comprehensive understanding of HIV/AIDS had only increased to 64% in relation to the said cohort (Government of Botswana, 2022).

These estimates show that many young people in Botswana have limited knowledge of HIV/AIDS issues (Ministry of Basic Education, 2016). This has led to negative attitudes and beliefs towards HIV/AIDS, fuelled by widespread belief in myths about transmission of the disease (Letamo, 2007; Letamo, 2019; Majelantle et al., 2014). Misinformation spread through myths can hinder rational decisions and correct behaviour regarding HIV/AIDS and lead to risky sexual behaviour (Letamo, 2019; UNAIDS, 2014). This is evidenced by the decrease in condom use among young people (15-24 years) over the years. Moreover, condom use has been shown to be lower among females (Government of Botswana, 2022)

Young people have been a priority population in Botswana's national response to HIV/AIDS, and various interventions have been initiated to engage adolescents and young people in an attempt to eliminate new infections (Nabisubi et al., 2021; Thomson et al., 2016). This includes mobilising resources for youth-funded prevention programmes such as pre-exposure prophylaxis (PreP), television programmes and youth centres to promote youth engagement on issues related to HIV/AIDS (Peterson, 2015; The Global Fund, 2022). Although prevention initiatives that focus on information and education programmes for young people have been implemented, they remain crucial and relevant and could be improved (Alhasawi et al., 2019; Majelantle et al., 2014). In order to make HIV/AIDS-related interventions more accessible and utilised by youth, it is important that they have a better understanding of the disease and its causes (Tavoosi et al., 2004; Zegeye et al., 2022).

In addition, there is an urgent need for HIV/AIDS prevention packages that are specifically tailored to the needs of young people, since the government of Botswana has adopted global HIV prevention programmes. These packages should aim to bridge the knowledge gaps in this age group. Therefore, examining HIV/AIDS knowledge will shed light on where young people lack understanding of the disease and why they engage in unsafe sexual behaviour. This has recently become an issue of great importance as strategies shift from biomedical interventions to more preventative measures. Therefore, ensuring proper education in the relevant area of interest means that people are likely to be motivated to utilise prevention resources, which will ultimately lead to disease control. Furthermore, by analysing the determinants of comprehensive HIV/AIDS knowledge, the government can better prioritise key areas to target resource allocation to ensure that correct and appropriate knowledge reaches young people.

Study rationale

To meet global targets for the reduction of HIV/AIDS by 2030, efforts have been made to shift from biomedical to preventive approaches (Fleischman & Peck, 2015). As such, five prevention pillars have been the focus of policy development since 2016[4] (UNAIDS, 2020). Adopting these

[4] **Pillar 1** - Combination prevention for adolescent girls, young women and their male partners in high-prevalence locations. **Pillar 2** - Combination prevention programmes for all key populations. **Pillar 3** - Strengthened national condom and related behavioural change programmes. **Pillar 4** - Voluntary medical male circumcision. **Pillar 5** - Offering PrEP.

pillars ensures that resources are invested in areas that address socio-economic, structural, and legal barriers that hinder access to services (UNAIDS, 2020). For example, the education level of the individual has been identified as a barrier to accessing and utilising preventative measures (Auerbach, Parkhurst & Cáceres, 2011). Removing these barriers, for example by providing individuals with comprehensive HIV/AIDS knowledge, will also ensure that individuals' ability to protect themselves and others from contracting HIV/AIDS is improved (Auerbach, Parkhurst & Cáceres, 2011).

In order to effectively address the issue of HIV/AIDS in Botswana, it is important to understand the factors that influence comprehensive knowledge about the disease. Understanding these factors will enable stakeholders to develop an inclusive and comprehensive framework that promotes the factors that support knowledge acquisition and address those that hinder comprehensive understanding. Additionally, such a framework will provide guidance on which areas should be prioritised in policy formulation and where resources can be redirected to ensure the dissemination of correct HIV/AIDS prevention messages among youth.

There is value in conducting knowledge assessments before implementing interventions, as doing so sheds light on whether the intended population will accept the proposed intervention (Nubed & Akoachere, 2016). Moreover, learning how much is known about a subject can help pinpoint where information is lacking, and guide targeted rather than broad interventions. To underscore the importance of diverse HIV prevention information, several scholars advocate for increased knowledge as a critical step toward behavioural change (Sarma & Oliveras, 2013; UNAIDS, 2014). For example, a study in Cameroon in 2016, showed that consistent HIV prevention awareness resulted in positive outcomes, including increased condom use to 56.3% from 37% found in the 2011 Demographic Health Survey (DHS) (Nubed & Akoachere, 2016). Other studies conducted such as the one in Peru by Achachagua et al. (2022) and Murwira et al. (2021) in South Africa found that increased knowledge about HIV reduced the likelihood of students engaging in risky sexual behaviour. Moreover, a study in Botswana conducted by Majelantle et al. (2014) found that positive attitudes toward HIV prevention prevailed among students who received HIV education.

Despite the government's efforts to reduce new infections, various studies showed an increase in infection rates among AGYW aged 10 to 19 years and among adolescent boys and young men (ABYM) (Government of Botswana, 2019). This group is part of the AYP, a cohort that represents

a significant proportion of Botswana's total population (UNAIDS-Botswana, 2023). These individuals have been identified as priority groups due to emerging and current issues that affect both genders such as high susceptibility to HIV and low HIV knowledge among AGYW as well as low acceptance of HIV protection among ABYM, as shown by BAIS IV and BAIS V (Statistics Botswana, 2022) . Moreover, many ABYM do not take advantage of prevention programmes such as testing and ART and generally have poorer health habits than AGYW. Unfortunately, such individuals contribute to the spread of HIV/AIDS by not being tested for HIV and not initiating treatment if the test result is positive. If their level of understanding and knowledge gaps are not addressed now, the progress made over the years in the national response will be lost.

During the early stages of the HIV pandemic, there was limited information on the disease, and as such, there was a significant investment in the development of HIV prevention messages, predominantly for older populations. This may have inadvertently contributed to the awareness gap among the youth (Government of Botswana, 2019). Furthermore, in Botswana, previous cycles of the Strategic Framework ignored key demographics such as the youth during intervention development (Government of Botswana, 2019).

The spread of HIV is often difficult to contain due to intergenerational transmission. Determining the current levels of awareness of HIV/AIDS, especially among young people, is therefore essential, as this knowledge may encourage risk-reducing behaviours (UNAIDS, 2021). Addressing sexuality and sexual risk issues is also important in young children because they are at greater risk of becoming infected with HIV as they grow older (Govender et al., 2018). Therefore, developing communication strategies with a focus on HIV and sexual and reproductive health (SRH) risk management strategies that promote delay in sexual initiation, correct condom use and regular check-ups are important. Additionally, tailored HIV prevention and education interventions are needed, rather than blanket approaches, which can be financially and programmatically inefficient and unsustainable. To ensure the sustainability of HIV/AIDS related efforts, it is crucial for the government to invest in efficient and effective interventions, given that they bear 70% of the costs (Government of Botswana, 2019). Therefore, although the government has already spent money to contain the spread of the virus, it is in the public interest to maintain the gains achieved over the years. Thus, the topic of comprehensive HIV/AIDS knowledge is relevant.

In recent years, behavioural change has been the focus of HIV programming, with many interventions aimed at changing the way people think and engage in HIV intervention programmes (Government of Botswana, 2019). In order to bridge knowledge gaps and optimise resources, it is important to understand HIV prevention among key populations. This understanding will enable the identification of key areas that encourage positive behaviours and promote safe sexual practices. Reaching those left behind in the treatment cascade will thus require understanding the reasons for new infections, the reasons young people engage in risky sexual behaviours and whether they have enough knowledge to protect themselves and others.

Aim and objectives

Aim

The proposed study aims to assess the socio-demographic determinants of comprehensive HIV/AIDS knowledge among young people in Botswana.

Objectives:

1. To identify the level of comprehensive HIV/AIDS knowledge among school going children in Botswana.
2. To identify the socio-demographic determinants of comprehensive HIV/AIDS knowledge among school-going children in Botswana.

Brief literature review

The social and economic impact of HIV/AIDS

The human immunodeficiency virus (HIV) targets the immune system and weakens an individual's resistance against many infections, which a healthy immune system can fight (World Health Organisation, 2022). Since its genesis, 84.2 million people worldwide have been infected with HIV, and 40.1 million have died from HIV/AIDS-related illnesses (UNAIDS, 2022b). By the end of 2021, 38.4 million people globally were living with the virus, and 1.5 million new HIV infections were recorded in the same year (UNAIDS, 2022b).

The HIV epidemic negatively impacts organisations and countries' economies (Bell, Devarajan & Gersbach, 2006; Poudel, Newlands & Simkhada, 2017). This is because most of the population infected by HIV/AIDS are working-age young adults (Poudel, Newlands & Simkhada, 2017),and continuous time off work reduces labour time in hours worked. Additionally deaths associated with HIV/AIDS negatively impact productivity inputs, leading to reduced profits for organisations (Poudel, Newlands & Simkhada, 2017). As countries focus on procuring HIV treatment for their people, overall health expenditure increases, which most countries cannot afford (Collins & Leibbrandt, 2007; Poudel, Newlands & Simkhada, 2017). This is indicated by a 2014 UNAIDS report which predicted that for the fast-track response to HIV/AIDS, an estimated US$ 35 billion was needed by countries (Resch, Ryckman & Hecht, 2015). However, this exposed financial challenges faced by governments in combating HIV/AIDS as only US$ 19 billion was available, with 49% coming from foreign donors (Nubed & Akoachere, 2016).

In addition to affecting economies, the HIV/AIDS pandemic also negatively affects communities and individuals (UNAIDS, 2019). The long-term treatment costs of HIV reduce individuals' ability to invest in other aspects of their lives such as food, education and other businesses (Poudel, Newlands & Simkhada, 2017). Furthermore, at an advanced stage of the disease, AIDS brings non-medical costs, such as labour time lost due to hours invested by others caring for people living with HIV/AIDS (PLWHA) (Duraisamy et al., 2006; Poudel, Newlands & Simkhada, 2017; von Rosen et al., 2018). AIDS-related deaths have led to children losing their parents, whilst some families have lost breadwinners which has led to poverty and a growing threat to stability and development (MacFarlan & Sgherri, 2001).

Despite global efforts to combat the pandemic, there is still a heavy load of HIV/AIDS in underdeveloped countries, especially in SSA (Abiodun et al., 2014; Alhasawi et al., 2019; Burkle, 2020). This is concerning because the risk of new illnesses is highest in the region, healthcare is not easily accessible and economic stability is low in SSA (UNICEF, 2021). Due to the limited resources in SSA, the proportion of HIV/AIDS still spreading through perinatal transmission from mothers to new-borns and through blood transfusions is still high compared to other regions (Creek et al., 2009; Gebremedhin et al., 2021). The increased incidence rates in HIV/AIDS also increase the risk of PLWHA contracting opportunistic infections such as tuberculosis (TB) (Government of Botswana, 2019). It is estimated that over 70% of all HIV-positive people are affected by TB, and that TB is responsible for 83% of all AIDS-related fatalities worldwide (Collins & Leibbrandt, 2007).

Determinants of the Spread of HIV/AIDS

In developing initiatives to curb the spread of HIV, various investigations were carried out to determine the root causes of global HIV prevalence to understand the factors behind discrepancies in HIV infection rates across countries. However, although scholars from many different disciplines including political science, anthropology and health studies have participated in these studies the results have been inconsistent due to different methodologies (Phaladze & Tlou, 2006; Poudel, Newlands & Simkhada, 2017; Thomson et al., 2016; von Rosen et al., 2018).

Studies on socioeconomic factors associated with HIV/AIDS knowledge have been conducted in South Africa and India (Bell, Devarajan & Gersbach, 2006; Duraisamy et al., 2006; Govender et al., 2018). In these studies, it has been shown that social and demographic problems such as poverty, parental illness, and orphanhood were some of the reasons why individuals engaged in sexual behaviour that led to HIV/AIDS (Duraisamy et al., 2006; Govender et al., 2018).

Biological factors are also known to be drivers of HIV/AIDS infections (Frieslaar, 2020) . For example, puberty and the onset of sexual interactions continue to occur at increasingly younger ages in most countries (Cockcroft et al., 2007; NACA, 2009). Peer pressure, cultural norms and gender-based violence have been cited as reasons for the early debut (Taukeni & Ferreira, 2016). This presents a significant challenge as it exacerbates the spread of HIV and other sexually transmitted diseases, leading to an increase in HIV/AIDS infections among young people (UNICEF, 2021). Additionally, the inadequate knowledge of HIV prevention measures and/or the inability to negotiate safe sex also contributes to the spread in these sexually transmitted diseases.

In 2021 the United Nations Children's Fund (UNICEF), estimated that 1,700 children under the age of 15 and 600 adolescents aged 15 to 24 were newly infected with HIV every day (UNICEF, 2017b). Some of these new infections can be attributed to the aforementioned reasons. Botswana, which also experiences these challenges, had 29 500 young adults between the ages of 15-24 years living with HIV/AIDS in 2019 (Government of Botswana, 2019).

It has been indicated that adolescent girls between the ages of 10-19 years were three times as likely to be infected as boys of the same age (UNICEF, 2021). Nonetheless, additional variables enhance the chance of young females contracting the virus, such as financial hardships leading to an inability to negotiate for safer sex, particularly with older men during transactional sexual encounters (Cockcroft et al., 2007; Duraisamy et al., 2006).

Various social factors drive the spread of HIV/AIDS including stigma and discrimination against people with HIV/AIDS. People living with HIV/AIDS have been discriminated against and stigmatised due to the fear of them disease spreading (Adane et al., 2020; Alhasawi et al., 2019). One of the factors contributing to this issue is the paucity of information about HIV/AIDS including how the virus is spread (Creek et al., 2009; Weiser et al., 2006). Additionally, individuals from key populations, such as female sex workers and men who have sex with men are negatively impacted by stigma and discrimination. This is because they may have challenges accessing SRH services, as they fear being judged for their lifestyle by healthcare providers who sometimes impose their cultural norms and beliefs (Alwafi et al., 2018; Asare, Aryee & Kotoh, 2020).

The stigma and prejudice surrounding HIV/AIDS are not only limited to healthcare workers and the health system (Collins & Leibbrandt, 2007). For example, there have been scenarios where private sector employees who were HIV positive were denied promotions and wage increases as well as not being recruited based on HIV status (Rodger et al., 2010). Meanwhile, in some countries, PLWHA and other minority groups were not afforded any legal protections for their human rights such as making pre-employment HIV testing illegal (McGoldrick, 2012; Rodger et al., 2010). Failure to implement legal procedures to protect these individuals may have led to increased HIV infections and mortalities due to failure to receive SRH services as well as under-reporting of critical programmes designed to improve HIV/AIDS.

Interventions to address the spread of HIV/AIDS

To curb the spread of HIV/AIDS, various initiatives have emerged due to collaboration between the government and stakeholders (Govender et al., 2018; Nubed & Akoachere, 2016). These included increased funding for HIV/AIDS research and treatment, disseminating information about prevention, acquiring testing equipment and advocating for measures to reduce the risk of mother-to-child transmission (Govender et al., 2018; Nubed & Akoachere, 2016; Teshale et al., 2021; Zegeye et al., 2022). As a result, in 2016, countries signed a UNAIDS political declaration to eliminate the AIDS pandemic by 2030, with HIV prevention as the key strategy (Zegeye et al., 2022). In addition, initiatives under the Sustainable Development Goals (SDGs) have been developed to respond to the needs of people living with and affected by HIV and those vulnerable to HIV infection (Govender et al., 2018; UNICEF, 2021; Zegeye et al., 2022).

Additionally, organisations such as the National Institutes of Health (NIH) have provided technical assistance, funding, and research to combat HIV/AIDS in the United States and around the world (CDC, 2003). This has been made possible through its agencies such as The Global Fund (TGF) and the President's Emergency Plan for AIDS Relief (PEPFAR). PEPFAR supports the fight against HIV/AIDS through the provision of resources towards HIV/AIDS interventions (PEPFAR, 2021). These include procurement of ART, voluntary medical male circumcision (VMMC) programmes, PMTCT, PrEP, key populations programmes and training of health care workers (PEPFAR, 2021). As of 2021, PEPFAR had provided HIV testing to over 60 million people and nearly 18.96 million people were receiving ART worldwide (PEPFAR, 2021). Moreover, through this agency, 2.8 million children born to HIV-positive mothers did not contract the virus at birth (PEPFAR, 2021). TGF also has assisted countries in their fight against HIV/AIDS, TB and malaria (The Global Fund, 2022). As of 2022, TGF had provided over 23 million ART for HIV, 70 million HIV tests and the program had also provided 670 000 mothers with PMTCT interventions and reached over 12.5 million people through HIV interventions (The Global Fund, 2022).

In order to achieve the goal of eliminating the AIDS pandemic by 2030, individual countries came up with localised interventions suitable for their country contexts. In Botswana, when HIV/AIDS was first discovered, the goal of the GoB was to educate the public about HIV/AIDS and create clinical management guidelines for those afflicted (Farrow, 1999; NACA, 2009). This was because little was known about the disease at the time, and it was important to educate the public about ways to protect themselves from infection. The initial plan to help achieve GoB's goal was the first

Medium Term Plan (MTPI) in 1987, focusing on prevention via sentinel surveillance, information, education, communication programmes, and blood screening for five years (Farrow, 1999). Through further consultations, it became clear that combating HIV/AIDS would require a multi-sectoral approach based on collaboration between government, civil society and donors. This necessitated the development of MTPI II (Farrow, 1999; Phaladze & Tlou, 2006). MTPI II had two goals: to stop the spread of HIV and to help those who were already infected. As a result, in 2002, the government began distributing ARVs to all patients with a CD4 count of less than 200 (Phaladze & Tlou, 2006). This was coupled with a nationwide HIV/AIDS awareness campaign to increase the number of people who get routine HIV testing and ART at government institutions (Phaladze & Tlou, 2006).

As more information about the disease became available and new challenges were identified, GoB developed the Botswana HIV strategic frameworks two and three (NSF II and NSF III) (Government of Botswana, 2019; Phaladze & Tlou, 2006). These two strategies formalised the government's commitment to halting the spread of HIV/AIDS through the following top priorities (Government of Botswana, 2019):

- preventing new infections
- systems strengthening
- strategic information management
- scaling up treatment, care and support

With strategic information and management as a priority, it was crucial to raise awareness of sexually transmitted diseases (STDs) and HIV/AIDS prevention, HIV/AIDS services and SRH services (Government of Botswana, 2019). Therefore, the GoB carried out several large-scale national information and education campaigns on HIV/AIDS prevention in schools and among the general population (Alwafi et al., 2018; Stephens et al., 2012). These campaigns included the use of media, the opening of free-standing volunteering centres, and the ‘Talk Back’ television programmes.

Comprehensive HIV/AIDS knowledge

During the United Nations General Assembly Special Session (UNGASS) on HIV/AIDS in June 2001, member states in attendance adopted the Declaration Commitment on HIV/AIDS (World Health Organisation, 2005). Under this declaration, core indicators aimed at reversing the HIV/AIDS pandemic by 2015 were applicable to all countries, and countries were expected to report on a 4-5-year basis (UNAIDS, 2008). As stated by World Health Organisation (2005), the indicator categories were:

1. National commitment and action
2. National knowledge and behaviour
3. National impact
4. Global commitment and actions.

Of the indicator categories developed, the second category included a variety of detailed knowledge and behavioural outcomes such as proper understanding of HIV transmission, age at first sexual intercourse, sexual behaviour, and school attendance of orphans (World Health Organisation, 2005). In this category, the 13th indicator allowed countries to track incremental progress in comprehensive HIV/AIDS knowledge over time, while in other countries it was used to maintain already existing high levels of knowledge focusing on young people (UNAIDS, 2008).

According to the recommendations of UNGASS and UNAIDS, as well as other large-scale surveys such as population and health surveys, simply knowing about HIV/AIDS was not enough. Instead, it was recommended that the level of understanding of HIV/AIDS be measured through the identification of myths and prevention strategies (UNAIDS, 2021). The 13th indicator of UNGASS, defined comprehensive HIV/AIDS knowledge as follows:

> *"Comprehensive knowledge means understanding that using condoms during sexual intercourse and having only one uninfected faithful partner can reduce the risk of contracting the AIDS virus, understanding that a healthy-looking person can have the AIDS virus, and rejecting the two most common local misconceptions about AIDS transmission or prevention[5]" (UNAIDS, 2021).*

[5] Common misconceptions are that a person should be able to reject the myth that a person gets HIV from mosquito bites and from sharing food with someone who is infected

When analysing comprehensive HIV/AIDS knowledge, the literature found that several determinants, including socioeconomic and demographic characteristics, were the drivers of comprehensive HIV/AIDS knowledge and the lack of comprehensive HIV/AIDS knowledge in AYP. On this basis, various surveys use these determinants to capture comprehensive HIV/AIDS knowledge. In these studies, participants' depth of understanding is measured by how many questions they answer correctly about HIV prevention and their ability to dismiss the myths about the disease (Abiodun et al., 2014). Participants are then assessed on socioeconomic determinants to evaluate their association with their comprehensive knowledge of HIV/AIDS.

An example of such a study is the Socioeconomic Status Study conducted among school-age youth in Eastern Ethiopia. In this study, adolescents from upper and middle-class households who heard about HIV/AIDS from peers or media performed better on knowledge tests (Motuma et al., 2016). Comparable findings were published by Darteh (2020), who found that young women with no television or radio had a lower likelihood of possessing thorough knowledge about HIV and AIDS. In other contexts like Bangladesh, comparable findings have been observed between media exposure and thorough knowledge of HIV and AIDS (Sarma & Oliveras, 2013). Similarly, a study conducted in India by Pachuau et al. (2021) found that HIV/AIDS knowledge among people aged 15- 49 years was associated with age, education level, wealth status, literacy, media exposure and place of residence.

Mude et al. (2020) demonstrated how place of residence can influence access to health information. The study found that women in South Sudan did not have adequate access to health information in certain regions where conservative religious and cultural beliefs were widespread. This led to inequalities in sexual interactions and marriages, dependence on male partners for financial support, and traditional patriarchy, which resulted in women being more vulnerable to contracting HIV/AIDS (Mude et al., 2020; Zegeye et al., 2022). In their study, Darteh (2020) showed that there are differences in comprehensive HIV/AIDS knowledge based on residence. Their research revealed that people living in the upper East region of Ghana had a higher likelihood of possessing comprehensive HIV/AIDS knowledge compared to those in other regions. This disparity was attributed to the higher number of NGOs in the North of Ghana that were responsible for providing sexual and reproductive health education.

Comprehensive HIV/AIDS knowledge and its impact vary by gender (Nubed & Akoachere, 2016). In South Africa, Murwira et al. (2021) showed that there was a variation in boys' and girls'

comprehensive knowledge of HIV/AIDS. Their findings also showed that while women were more knowledgeable in some regions of South Africa, men were more knowledgeable in others. On the other hand, Majelantle et al. (2014) showed that women (79.2%) knew more about the relationship between HIV and AIDS compared to men (73.9%) in Botswana, and that women were also more aware of other HIV prevention programmes such as PMTCT. In contrast, some studies have shown that men are more likely to initiate conversations about HIV/AIDS than women, leading participants to believe that men are more knowledgeable (Abiodun et al., 2014; Alhasawi et al., 2019).

Asare, Aryee and Kotoh (2020) and Thomson et al. (2016) focused on determining the association between age and comprehensive HIV/AIDS knowledge. Their results showed that adult women did not have comprehensive HIV/AIDS knowledge compared to adult men. Alhasawi et al. (2019) also found that age plays a role in comprehensive HIV/AIDS knowledge. According to their study, adolescents' lack of comprehensive HIV/AIDS knowledge increases their susceptibility to risky sexual behaviour and infections. Visalli et al. (2019) also pointed out that younger students are not sufficiently informed and have misconceptions about sexually transmitted diseases compared to older students. For this reason, some studies argue that this lack of understanding and the increasingly lower age at sexual debut increases the risk of contracting HIV/AIDS (Alwafi et al., 2018; Majelantle et al., 2014).

Comprehensive HIV/AIDS knowledge has also been linked to having a positive attitude towards HIV/AIDS (Alhasawi et al., 2019; Nubed & Akoachere, 2016). This is consistent with Alhasawi et al.'s (2019) study that reported that a lack of comprehensive knowledge about HIV/AIDS resulted in gaps between the current level of promotion of HIV prevention services and young people's attitudes towards PLWHA. Furthermore, as Letamo (2019) notes, a lack of comprehensive HIV/AIDS knowledge results in AYPs' inability to take adequate precautions against contracting HIV. These results also align with a study in South Africa by Harrison, Xaba and Kunene (2001) that found that young people did not practice safe sex regularly, and in certain cases a lack of skills for negotiating for safer sex was caused by a lack of thorough knowledge about HIV/AIDS.

Finally, a study found that people living with HIV/AIDS who are more knowledgeable about HIV/AIDS are more likely to seek treatment, care and support (Zegeye et al., 2022). Alhasawi et al. (2019) found that improved behaviour, increased utilisation of HIV/AIDS services, and positive

attitudes toward HIV/AIDS are all associated with comprehensive knowledge about HIV/AIDS. Similarly, Mude et al. (2020) observed that greater education and wealth increase the likelihood that women have good knowledge and positive attitudes towards PLWHA. This is consistent with the results from Alhasawi et al. (2019) and Alwafi et al. (2018) who indicated that young people in science have a better understanding of HIV/AIDS. According to their findings, compared to science students, some students said they would not buy vegetables from an infected vendor, while others said they would not share a classroom with an infected student, while others believed that people living with HIV should be isolated.

On the other hand, misconceptions about HIV/AIDS due to a lack of comprehensive HIV/AIDS knowledge contribute to the stigmatisation of ART services and PLWHA (Letamo, 2019). Consequently, these myths have contributed to the stigmatisation that prevents people from accessing HIV and SRH services (Abiodun et al., 2014; Asare, Aryee & Kotoh, 2020). In addition, limited awareness of HIV/AIDS prevention has resulted in young people not adhering to treatment because they are afraid of being seen or because they do not understand how the medications work (Frieslaar, 2020; Thomson et al., 2016).

Furthermore, the extent to which individuals understand HIV/AIDS and the experiences of PLWHA is also a significant determinant of how they shape their opinions and emotions about these issues. Evidence from other studies suggests that people's utilisation of HIV and SRH services will be affected by their HIV/AIDS literacy (NACA, 2019). Teshale et al. (2021) argue that access to education increases knowledge about and use of HIV/AIDS services because it exposes people to the material on the topic. Gebremedhin et al. (2021) agreed with Teshale et al. (2021) and highlighted that a greater likelihood of using PMTCT services was observed among women with minimal knowledge of HIV prevention methods than among those without any knowledge.

Capacitating individuals with the right prevention knowledge has been cited as a key strategy in the fight against HIV/AIDS. As discussed above, special attention should be paid to promoting the socioeconomic determinants that drive knowledge to ensure that individuals, including young people, have comprehensive HIV/AIDS knowledge. When developing health promotion strategies, implementers should be aware of religion, age, gender, cultural norms, access to media, and type of residence as these play a role in whether or not information is effectively communicated to the youth.

Government efforts to increase knowledge of HIV/AIDS

In order to close the knowledge gap that existed at the time of HIV's initial discovery in Botswana, the government initiated a number of health promotion campaigns. In addition to government efforts, non-governmental organisations (NGOs) and civil society collaborated with schools to conduct sessions on HIV/AIDS prevention, life skills, and related topics (Ramogola-Masire et al., 2020; Sarma & Oliveras, 2013). Lessons focused on how to properly use condoms and the various HIV infection modes, all the while reinforcing the idea that new infections were mostly caused by carelessness and promiscuity (Ramogola-Masire et al., 2020). In addition, abstinence education was intensively promoted in schools as a tool for HIV prevention (Ministry of Basic Education, 2016).

Thus, in light of the recent BAIS' concerns about the prevalence of HIV infection among AYP, the government has chosen to focus some programme implementation on ABYM and AGYW (Government of Botswana, 2019). Improving access to accurate and complete information about HIV has become a government priority because the information may motivate and encourage individuals to seek HIV prevention services and treatment when necessary (Government of Botswana, 2019; Majelantle et al., 2014; UNICEF, 2017b). Given that most teenagers spend a significant amount of time at school, there is a great opportunity to reach them in this setting and educate them about HIV prevention (Ministry of Basic Education, 2016). School based prevention programmes can also be used to educate on other STDs with the ultimate goal of reducing their prevalence prior to initiation of sexual activity (Kelly, 2000). Some schools have implemented HIV/AIDS prevention education and awareness programmes, including *Makgabaneng*, Talkback, and Choose Life (Majelantle et al., 2014).

HIV/AIDS education to young people in Botswana

As the understanding of how HIV spreads increases, managing how it spreads has required ensuring that people have the necessary knowledge (Ramogola-Masire et al., 2020). The Botswana government has implemented strategies to disseminate HIV/AIDS awareness to people in a variety of contexts over the years in cooperation with non-governmental organisations. To raise public awareness of HIV/AIDS, several initiatives were initiated, including HIV testing and counselling centres, informational material distribution, and public health campaigns (Government of Botswana, 2019; Ramogola-Masire et al., 2020).

The government started implementing HIV/AIDS education in schools in the late 1990s. With donor assistance, teacher training manuals on HIV/AIDS were created, and teachers received capacity building on the provision of comprehensive HIV/AIDS education to students (Botswana Ministry of Education, 2005; World Health Organization, 2008). Peer education programmes were also developed, with the goal of preparing older students to teach their younger peers about the virus (Botswana Ministry of Education, 2005). Additionally, local CBOs organised awareness workshops for the public and students in order to give accurate information about the disease(Ramogola-Masire et al., 2020). Brochures, pamphlets and other educational materials were widely distributed to ensure that people had reliable information on HIV/AIDS (Ramogola-Masire et al., 2020).

The terrain of HIV/AIDS education in Botswana has evolved over time due to changes in communication techniques and the digitisation of information. With the intention of expanding reach, new strategies have surfaced in addition to the conventional communication techniques (Chandran, 2016). The public is now primarily informed about HIV/AIDS through social media and online platforms, either by the government or non-governmental organisations (Chandran, 2016). Furthermore, online support groups, podcasts, webinars, and mobile applications have become well-known platforms for agencies to use when disseminating data, messages, and personal recollections (Chandran, 2016; Taggart et al., 2015). Typically, social media is used to spread HIV/AIDS messages primarily to young people. The younger people have access to social media via their mobile phones, the more likely young people are to use social media platforms regularly. Additionally, social media allows for tailored communication with videos and animations that are more appealing to younger audiences (Kuppuswamy & Narayan, 2010).

Although HIV/AIDS communication has evolved to provide information more widely and more easily accessible, there are still risks involved. In schools, it has moved from traditional classroom methods to a digital space where online platforms are essential for spreading knowledge (Kuppuswamy & Narayan, 2010). Although this is beneficial, there are also significant disadvantages involved, particularly since media has historically been one of the main sources of information for young people. Firstly, owing to their socioeconomic status, not every young person has access to the internet (Sarma & Oliveras, 2013). Additionally, despite the abundance of information available online, some of it may be false or misleading, which could compromise young people's understanding of HIV/AIDS (Kuppuswamy & Narayan, 2010). Therefore,

mechanisms must be established to guarantee that young people have access to accurate information.

Measuring comprehensive HIV/AIDS knowledge

As discussed in more detail above, various studies have concluded that knowledge is a prerequisite to health behaviour change (Janulis et al., 2018). Different studies have used different methods to measure comprehensive knowledge of HIV/AIDS. Some studies have used the UNGASS definition of comprehensive HIV/AIDS knowledge, while others have used psychosocial tests. Researchers using the psychosocial perspective have challenged those from other fields, highlighting that the majority of HIV knowledge questions have not been subjected to rigorous psychometric testing, including applying item response theory (Janulis et al., 2018).

Error! Reference source not found. shows studies that used the UNGASS questions to measure comprehensive HIV/AIDS knowledge. Although the UNGASS 13th indicator has five questions, different studies have manipulated variables to fall within the five questions to focus on their different studies' objectives.

Table 1: Various Methods of Measuring Comprehensive HIV/AIDS Knowledge guided by UNGASS

Studies	**Method of Measuring Comprehensive HIV/AIDS Knowledge**
• UNAIDS Studies (UNAIDS, 2008) • Demographic Health Surveys (Ministry of Health Lesotho, 2016) • Women's decision-making capacity and its association with comprehensive knowledge of HIV/AIDS in 23 sub-Saharan African countries (Zegeye et al., 2022) • Assessing HIV/AIDS Knowledge, Awareness, and Attitudes among Senior High School Students in Kuwait (Alhasawi et al., 2019) • HIV-related knowledge, attitudes, and practice among educated young adults in Botswana (Stephens et al., 2012)	$\frac{\text{Number of respondents 15– 24years old who correctly answered all five questions}}{Number\ of\ all\ respondents\ 15-24 years\ old}$ • Is it possible to reduce the risk of HIV transmission by having sex with only one faithful, uninfected partner? • Is it possible to reduce the risk of HIV transmission by using condoms? • Is it possible for a healthy-looking person to have HIV? • Is it possible to contract HIV from mosquito bites? • Is it possible to contract HIV by sharing a meal with someone who is infected? Anyone who can successfully answer all five questions has a comprehensive understanding.
Knowledge, attitudes and practices regarding HIV/AIDS among senior secondary school students in Fako Division, South West Region, Cameroon (Nubed & Akoachere, 2016)	An identical series of questions was administered to 18 elderly respondents, with a score of 1 for each correct response and a score of 0 for each incorrect response. Scores of 50% or less were categorised as having poor knowledge, 51%-74% as having moderate knowledge, and 75% or more as having good knowledge.

Knowledge and attitude of secondary school students in Nakaseke, Uganda, towards HIV transmission and treatment (Nabisubi et al., 2021)	Two types of closed questionnaires (Yes/No and multiple choice) were administered to participants to gauge their familiarity with HIV/AIDS. Accuracy in answering questions was measured as a percentage (80% was considered adequate).
Knowledge and attitudes toward HIV/AIDS among the general population of Jeddah, Saudi Arabia (Alwafi et al., 2018)	A total of 9 questions (HIV prevention and misconceptions associated with HIV/AIDS) were asked to the participants, all of which tested their knowledge but were distinct from the examples given above. Only two questions offered more than two possible responses, while the other seven could only be answered with either a yes or no. A score between 7 and 9 was considered a good result, while 4 to 6 was average, and between 0 and 3 was considered as very poor.
HIV/AIDS knowledge and attitudes assessment among women of child-bearing age in South Sudan: Findings from a Household Survey (Mude et al., 2020)	Nine statements were included in the questionnaire that was distributed to the students. Each correct answer earned one point while incorrect answers held no value. Respondents with at least six accurate answers (i.e., 70% correct replies) were considered as having good knowledge of HIV, while those with less than 70% of correct responses had a poor understanding of HIV.
Knowledge and attitude towards HIV/AIDS among Iranian students (Tavoosi et al., 2004)	Questions were answered using the radio buttons for "Agree," "Disagree," and "I don't know." The total score for the knowledge test was determined by adding the points for each correct response. Two points were awarded for each correct response, one point for "I don't know," and no points were given for any wrong answers. The total score, which could be between 0 and 40, was the sum of the parts. A higher number of points reflected deeper comprehension.

The lack of overall coherence and similarity among the studies is a drawback. It is difficult to replicate comprehensive HIV/AIDS knowledge in other studies because it is typically customised to the authors' goals, despite the fact that the definition of the concept is well-defined in the UNGASS guidelines. Furthermore, although the UNGASS indicator is designed to measure knowledge, most studies that have used it have attempted to include behaviour and attitude tests as well. These studies include a study by Alhasawi et al. (2019) and Stephens et al. (2012) who used both UNGASS questions and included attitude assessment questions in their studies.

Error! Reference source not found. contains tests that different researchers developed intending to gauge early HIV/AIDS knowledge. The 45-item scale was widely used as a measure of HIV knowledge; however, it was soon revised to a shorter 18-item version which had strong internal consistency, test-retest reliability, and correlation with the 45-item version (Carey & Schroder, 2002; Janulis et al., 2018).

Table 2: Other Methods of Measuring Comprehensive HIV/AIDS Knowledge (not guided by UNGASS)

Studies	Method of Measuring Comprehensive HIV/AIDS Knowledge
45 HIV Knowledge Questionnaire (HIV-KQ) soon revised to the 18 HIV Knowledge Questionnaire (Carey & Schroder, 2002)	Respondents would read 45 statements about HIV and would indicate whether they think the statement is true or false, or that they "do not know." A single summary score would be obtained by summing the number of items correctly answered ("do not know" responses are scored incorrect). For every correct response, one point would be awarded. With one point awarded for each correct response, the total score would show how many questions were answered correctly. A higher score indicated a higher level of HIV-related knowledge.

Table 2 shows one way to measure HIV knowledge outside the scope of the UNGASS guidelines. It is important to note that this type of questionnaire offers limited opportunities to assess knowledge about HIV/AIDS. In addition, it has been argued that the results of this type of questionnaire lack consensus when studying different populations and show indirect associations between HIV/AIDS knowledge and sexual risk behaviour. (Carey & Schroder, 2002). These questionnaires produce inconsistent results despite being praised for their comprehensiveness (Carey & Schroder, 2002).

While UNGASS has provided a general guideline for assessing HIV/AIDS knowledge, various studies may tailor these guidelines to suit their own study objectives. Although certain studies will solely evaluate knowledge, others will also include elements of attitudes and practice (Majelantle et al., 2014; Nubed & Akoachere, 2016). However, some studies will deviate from the scales that are already in use and develop their own measuring tool under the direction of subject-matter experts (Arslan, 2018).

Summary of the literature review

The literature review covered a wide range of topics on HIV/AIDS, including its impact on society and the economy. It examined the determinants of HIV/AIDS and highlighted important factors that contribute to the spread of the disease in order to understand the impact of the disease. These variables include educational attainment, gender, religion, and socioeconomic status.

Additionally, government initiatives to improve general HIV/AIDS awareness were explored. It is clear from the review that the government has created a range of interventions led by strategies to support HIV/AIDS prevention initiatives. Tailored information dissemination approaches that target youth and keep pace with changing HIV/AIDS dissemination strategies are also highly valued. However, different methods have been used to explore the determinants of comprehensive HIV/AIDS knowledge. The UNGASS methodology emphasises the use of a single comprehensive approach to examining comprehensive HIV/AIDS knowledge among adolescents as this allows for the generalisation of findings to other areas.

The focus of the review was to understand the importance of having comprehensive knowledge of HIV/AIDS and its role in disease transmission. Comprehensive knowledge of HIV/AIDS is influenced by several determinants, many of which are similar to the factors that drive transmission of the virus. Research shows that raising awareness is critical to curbing the HIV/AIDS epidemic.

This brief literature review therefore assessed the importance of understanding the factors that contribute to comprehensive knowledge about HIV/AIDS, as this will clarify how the identified determinants are used to develop interventions.

Conceptual framework

Several frameworks have been used by different studies to understand how well-informed people are about HIV/AIDS. These include The Theory of Planned Behaviour (TPB), Social Cognitive Theory (SCT), and Socio-Ecological Model (SEM), however, the Health Belief Model (HBM) and the Socio-Ecological Models are the primary theories that will be used for this research. The theories have found widespread application in health-related research to understand health-seeking behaviours and health outcomes (Ban & Kim, 2020).

The Health Belief Model

The HBM is grounded in the notion that individuals evaluate the different health-related environments they encounter and consider how these environments affect their behaviour (Ban & Kim, 2020). The model contends that an individual's health-related behaviour is shaped by their perception of the risk of illness and the advantages of taking preventative measures (Glanz, Rimer & Viswanath, 2008; Zainiddinov & Habibov, 2016). The beliefs and attitudes that influence health-related decisions and behaviour are shaped by knowledge, making it a crucial determinant in the framework of the HBM.

The model includes several key components that are significant in understanding how individuals come to know about health-related issues. In this regard contracting HIV/AIDS and experiencing symptoms that weaken the immune system, potentially leading to death constitute the disease's perceived threat. The benefit of action is taking proactive steps to prevent the virus from spreading by changing one's sexual behaviour. According to the HBM framework, a person needs to be aware of the potential negative consequences in order to adopt advised health behaviours, like regularly using condoms during intercourse. To avoid engaging in risky sexual behaviour, for instance, one must be aware of HIV/AIDS transmission and the potential consequences if the virus is contracted (Ban & Kim, 2020).

Furthermore, knowing what influences healthy behaviour is beneficial (Turner et al., 2004). According to the HBM, behaviour is impacted by the possibility of action, which is established by perceived advantages and obstacles to engaging in a behaviour (Turner et al., 2004). Additionally, several factors can either help or hinder a behaviour. These comprise personal perspectives, sociodemographic traits, information, and cues to action—people or situations that affect a person's perceptions (Ban & Kim, 2020). **Error! Reference source not found.** below summarises the components of the HBM.

Modifying factors, as represented in the model, are contextual features that can affect how the elements of the model are understood and used (Ban & Kim, 2020) . In other words, these moderating factors help explain why individuals may or may not participate in health-promoting activities (Ban & Kim, 2020) . All of these factors are related to the decision-making processes people go through to determine how vulnerable they are to HIV, how serious the consequences are, how much knowledge is worth, and what obstacles they might face (Ban & Kim, 2020). People who lack thorough knowledge about HIV/AIDS may believe themselves to be less vulnerable and may not fully understand the severity of the virus (Turner et al., 2004). It also leads to a reduction in self-efficacy, an exaggerated view of obstacles, and an underestimation of the benefits of preventive measures. Therefore, uninformed people are more likely to participate in activities that could contribute to the spread of HIV (Turner et al., 2004).

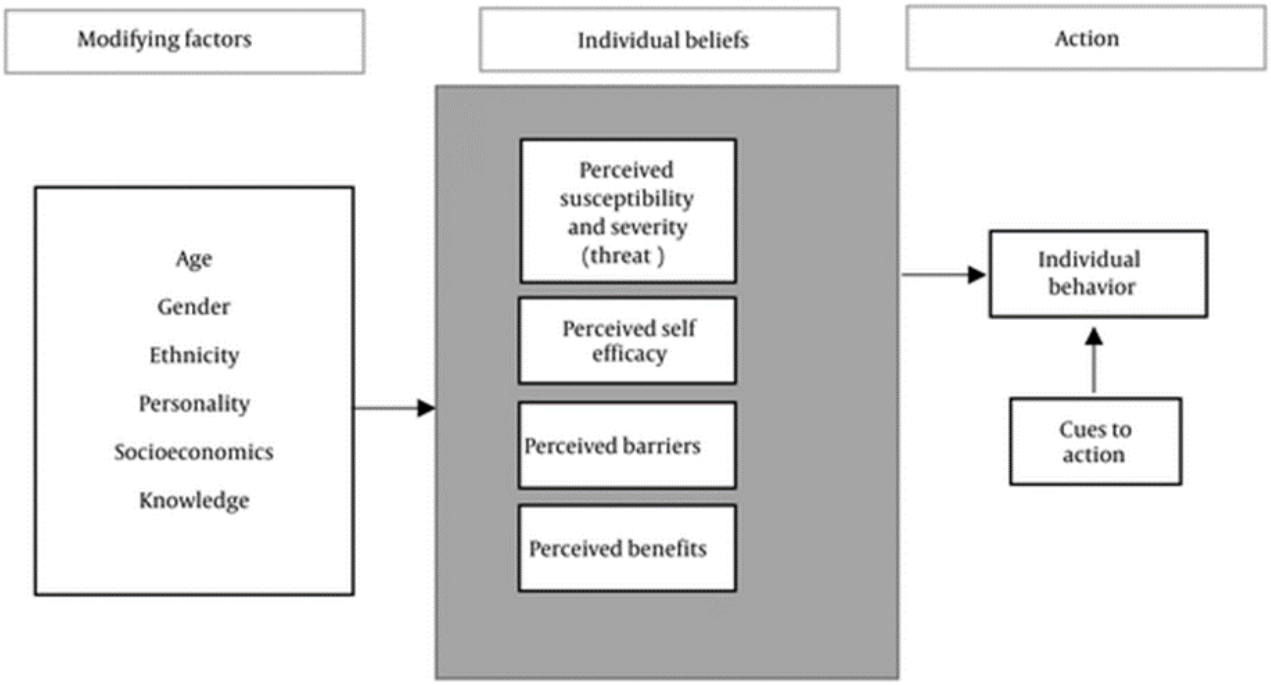

Figure I. Health Belief Model components and linkages (Glanz, Rimer & Viswanath, 2008)

Previous studies on HIV/AIDS prevention have also used the HBM model to address HIV/AIDS knowledge, transmission methods, and its myths and facts. These include applying the modified health belief model to Korean medical tourism carried out by Ban and Kim (2020) and design and implementation of an osteoporosis prevention programme using the health belief model by Turner et al. (2004). In addition, the model has been applied to programmes that promote health, prevent disease, and forecast individual changes in health-related behaviours (Glanz, Rimer & Viswanath, 2008). This is because it helps to understand the variables that influence a person's sexual behaviour and level of knowledge within a given society.

The Socioecological Model

The SEM is another framework that can be used to examine the association between sociodemographic determinants and specific health outcomes. The SEM accounts for numerous degrees of influence, while many other models use tightly defined frameworks (Dyson et.al., 2018). Comprehensive HIV/AIDS knowledge is influenced by various social and demographic aspects, as mentioned by various writers in the literature review which is catered for under SEM. Furthermore, SEM states that "people's health outcomes" in this case Comprehensive HIV/AIDS knowledge is a product of mutual interactions within and between their social and physical surroundings (Bronfenbrenner, 1979). These levels are individual, interpersonal, organizational, community and political. Below is the is figure A of the SEM with the determinants identified under the current study. The SEM-guided analysis of the correlation between the levels of the variables and youths' comprehensive knowledge of HIV/AIDS is depicted in Figure 2.

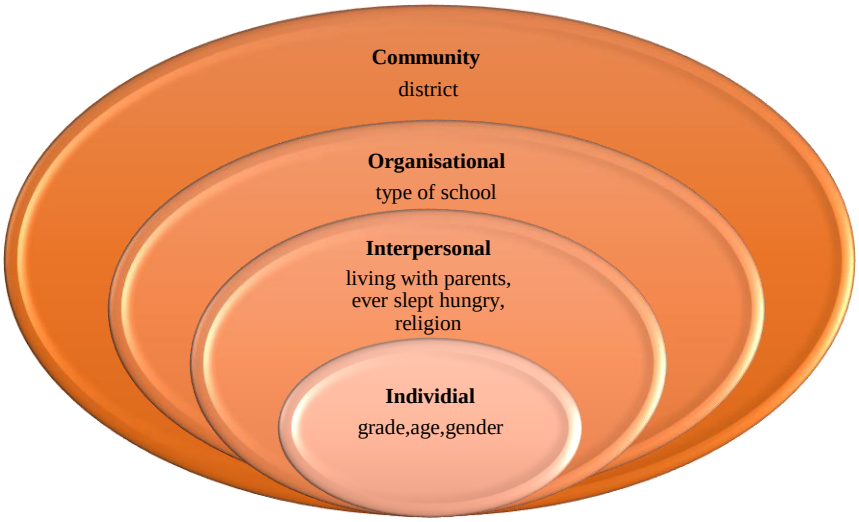

Figure II Socio-Ecological Model as adapted from (Bronfenbrenner,1979)

As previously mentioned, the SEM suggests that the environment has an impact on health outcomes. This is also explained by McLeroy (1988) and Dyson (2018), who note that the environment has a direct influence on the health outcomes of the individual and that, in turn, the individual also influences their environment through the way they interact with it. The levels of influence defined by SEM as stated by McLeroy (1988) and Dyson (2018) are:

i. The community level factors include the district in which the school is located. Location is crucial as it will determine proximity availability of resources that enhance HIV/AIDS knowledge.

ii. Organizational level factors, include the type of school (public vs. private) the child attends. The type of schools further speaks to availability of resources that enhance learning.

iii. Interpersonal factors such as family set up, socio-economic background and religion can impact comprehensive HIV/AIDS knowledge.

iv. Individual-level characteristics such as age, gender, and grade level are believed to play a role in an individual's level of comprehensive HIV/AIDS knowledge.

By examining these levels of influence, the results can reveal the most influential factors in shaping comprehensive HIV/AIDS knowledge. Consequently, targeted interventions can be formulated to close knowledge gaps.

Methodology

Source of data

The proposed study will use secondary data from the 2015 Second Botswana Youth Risk Behavioural and Biological Surveillance Survey (BYRBBSS II). The data is available from the Ministry of Education and Statistics Botswana. Although the data is nearly a decade old, it is the most recent nationally representative data on HIV/AIDS knowledge among school children. Additionally, the Windows of Hope program is still taught in schools to date. The BYRBBSS II was conducted in 135 public and private schools in the ten districts overseen by the Ministry of Basic Education (MBE). Interviews took place between February and April 2015 (Ministry of Basic Education, 2016). The participants in the study were between the ages of 13 and 19 years which is representative of school-going children in Botswana (Ministry of Basic Education, 2016).

A stratified multi-stage sampling procedure was used to select the participating schools and classrooms (Ministry of Basic Education, 2016). Schools were first stratified by district, and then by class, where a list of classes from each sampled school was organised by grade (grade 8, 9, 10 11, and 12). The primary sampling unit was the school, and the classroom was the secondary sampling unit. Schools were selected based on their enrolment size. Finally, a sampling frame derived from the MBE's 2014 master list of schools' enrolment data was used to select the schools (Ministry of Basic Education, 2016).

Students were eligible to participate if they regularly attended a secondary school, were in grade 8 to grade 12, had permission from their parents or legal guardians to participate, and gave informed consent (Ministry of Basic Education, 2016). Of the 9,590 students who were eligible to be included in the study, 7,564 (78.9%) provided informed consent and assent to participate in the survey (Ministry of Basic Education, 2016). To ensure that the sample represents the student population, weights were applied to each student record after data collection to account for nonresponse bias (Ministry of Basic Education, 2016).

Outcome variable

The choice of questions to use to compute the comprehensive HIV/AIDS knowledge variable for this study was guided by the UNGASS 2001 declaration. Five questions from the study were selected to represent each category in the UNGASS definition of comprehensive HIV/AIDS, identifying HIV prevention questions and rejecting misconceptions about HIV/AIDS. The five questions are given below:

1. Q82: Can HIV prevention be reduced by having sex with only one faithful, uninfected partner?
2. Q83: Do you think that a healthy-looking person can be infected with HIV?
3. Q85: Can a pregnant woman infected with HIV transmit the virus to her unborn child?
4. Q86: What can a pregnant woman with HIV do to reduce the risk of transmission of HIV to her unborn child? (For this question, correct answers are counted as 1, each incorrect answer is awarded zero)
5. Q87: Can a woman with HIV transmit the virus to her newborn child through breastfeeding?

For each question, a "correct" answer was scored “1” while an incorrect answer was scored 0. Aggregate scores were applied as an outcome variable, namely the HIV prevention awareness score which can range from 0 to 5, where 5 indicates thorough knowledge of HIV prevention and any score less than 5 indicates low awareness of HIV prevention (UNAIDS, 2021). Since a participant's knowledge of HIV/AIDS was evaluated based on their score, we adopted the UNGASS 13th indicator reporting criteria, which defines comprehensive knowledge as a dummy variable where 1 represents a respondent who got all the answers correct, and 0 otherwise. This threshold has been used by several authors, including the UNAIDS and DHS studies, as **Error! Reference source not found.** shows.

Data Analysis

The data was analysed in three stages. Descriptive statistics, such as frequency and percentage tables were the first to be computed. The significance level for all analyses was set at 5% ($p = 0.05$). Stata 14 was used for data exploration, cleaning, and analysis.

For the econometric analysis, a multilevel regression model was used to determine the association between the covariates and the outcome variable. A multilevel regression model was deemed appropriate for this analysis because some variables that affect the students’ comprehensive knowledge of HIV/AIDS are at

the individual and group levels (in this case, region and type of school) (Bickel, 2007). Multilevel regression analysis would thus account for the hierarchical structure, allowing for the estimation of variables at different levels (Bickel, 2007). For this study, data was organised in groups at different levels: students (level 1) nested within schools (level 2), and schools nested within regions (level 3) - see **Error! Reference source not found.** below.

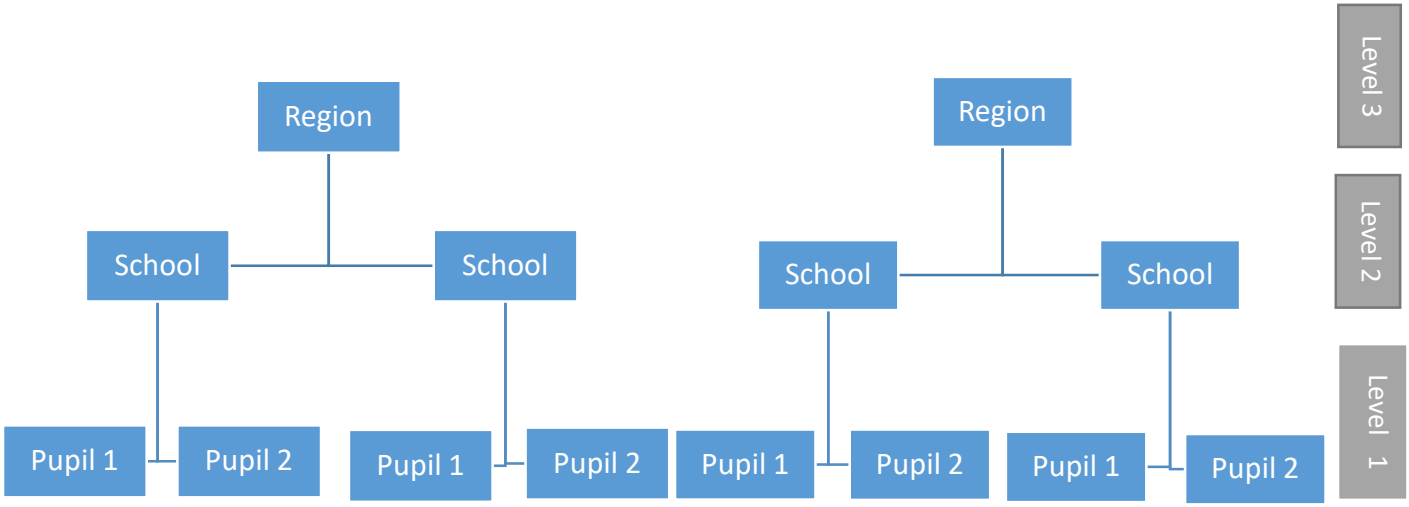

Figure III Hierarchical data structure (3 level)

A three-level mixed-effects logistic regression model was used to estimate both independent (fixed) effects of the explanatory variables and community-level random effects of comprehensive knowledge of HIV/AIDS. The log odds of having comprehensive knowledge of HIV/AIDS were modelled using a three-level multilevel model as follows (Goldstein, 1991) ;

$$\log\left[\frac{\pi_{ijk}}{1-\pi_{ihk}}\right] = \alpha + \sum_m \beta_m x_{mijk} + \sum_{l=1}^{l=3} \gamma_l z_{lijk} + \nu_k + \upsilon_{jk} + \varepsilon_{ijk} \quad \textbf{Equation 1}$$

Where i refers to the student (level 1), subscripts j and k refer to the school (level 2) and region (level 3), respectively; $x_{mijk}$is the m^{th} fixed effect covariate measured on the i^{th} student in the j^{th} school in the k^{th} region; π_{ijk} is the probability of having comprehensive knowledge of HIV/ AIDS for the i^{th} student in the j^{th} school and k^{th} region, respectively. α refers to the intercept; z is the covariates corresponding to the random effects, measured on the i^{th} student in the j^{th} school and k^{th} region; β_m is the fixed effects regression coefficients or parameters, while γ is the random effects. The random variable distributions $v_k \approx N(0, \sigma_v^2)$, $v_{jk} \approx N(0, \sigma_u^2)$ and $\varepsilon_{ijk} \approx N(0, \sigma_e^2)$ are assumed to be independent across levels.

The multi-level model is preferred to the traditional binary logistic regression, as the latter assumes that conditional on the covariates the comprehensive knowledge HIV/AIDS of students is independent and disregards potential intra-cluster correlation among observations within a cluster (Carle, 2009). Therefore, traditional logistic regression may generate biased results and conclusions. Multilevel models take into account the clustered nature of the data, can correctly estimate standard errors, lead to more accurate inferences, and allow investigating sources of variations within and across clusters.

Expected results and implications of the study

Since the sample size is representative of the population of school-age children in Botswana, the results showed the general comprehensive knowledge of youth regarding HIV/AIDS. Additionally, based on the findings, the socio-demographic factors that have a significant impact on the overall comprehension of HIV/AIDS were clearer.

Possible difficulties and solutions

Owing to methodological issues in the survey questionnaire, certain crucial independent variables related to the outcome variable were unavailable for analysis because the survey was conducted at schools without parental or guardian input. These variables include the parental educational background, and household income or wealth. The lack of these indicators creates a gap regarding how the AYP's economic background in the context of Botswana can affect their comprehensive knowledge of HIV/AIDS. As a proxy of socioeconomic status, the study used hunger experience and living with parents in analysing the outcome variable.

Key indicators that are commonly used in assessing a person's knowledge of myths related to HIV transmission were not collected in the study. For example, some people believe that HIV can be transferred through mosquitoes (UNAIDS, 2008). The availability of these key indicators would have ensured that knowledge about HIV/AIDS is thoroughly assessed in all aspects. Moreover, since the survey was conducted before several significant initiatives, such as the AGYW program DREAMS, it is imperative to interpret the findings with caution because attitudes regarding HIV prevention may have evolved since the conclusion of the survey.

Ethical Considerations

Informed Consent

The data that was used for this research study is publicly available. During primary data collection, all principles stated in the Belmont report on human research were followed (Department of Health, 1979; Ministry of Basic Education, 2016).

Study Approval

Before data was gathered, the Health Research Development Committee (HRDC) and the CDC Institutional Review Board (IRB) examined and approved the initial survey procedure and questionnaire (See Appendix for questionnaire) (Ministry of Basic Education, 2016). Although the proposed analysis did not directly involve interaction with human subjects, permission to carry out the proposed study was sought from the University of Cape Town's School of Public Health and Family Medicine (SPHFM) Departmental Research Committee (See Appendix).

Timeline

Activity	Jul '22 - Oct' 22	Nov '22	Dec '22	Jan '23	Feb '23	Mar '23	Apr '23	May '23	Jun' 23	Jul '23	Aug' 23	Sep' 23	Oct '23	Nov '23	Dec '23	Jan '24	Feb '24
Protocol Development																	
Submission to ethics																	
Literature review																	
Submit Literature Review section to supervisors.																	
Attend to Literature Review feedback, Data analysis, write-up and submission of mini-dissertation sections to supervisors																	
Request for ethics renewal																	
Submit Intention to submit documents																	
Final drafts corrections																	
Submission of mini dissertation																	

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PART B – STRUCTURED LITERATURE REVIEW

Introduction

This chapter focuses on factors associated with comprehensive knowledge of Human Immunodeficiency Virus/Acquired Immunodeficiency Syndrome (HIV/AIDS). The section is organised as follows: First, theories commonly used to understand knowledge about HIV/AIDS are examined. The contextual background of HIV/AIDS in various countries, including Botswana, is then explained. This is followed by an introduction to the common sources through which people obtain information about HIV/AIDS and the problems associated with these sources. An examination of the dissemination of comprehensive knowledge about HIV/AIDS, the motivations for researching that knowledge, and how it is measured, drawing on existing literature follows. Finally, the literature is reviewed on methods used to identify determinants of comprehensive HIV/AIDS knowledge and illustrative examples of these determinants are provided. The chapter concludes with a summary.

Theoretical framework

This section presents the theoretical frameworks of this study. The theories are briefly discussed, with their general application in public health-related studies further analysed. The main aim is to highlight their theoretical and practical relevance to the current study. In their general application, the theories become helpful as guiding tools in the design of new HIV and AIDS-related public health interventions. At the centre of comprehensive HIV/AIDS knowledge is the assumption that individuals are equipped with the facts (UNAIDS, 2008). Also, various determinants influence their acquisition for correct information related to HIV and AIDS (Ramogola-Masire et al., 2020). The chosen theories are based on their relevance in acknowledging the importance of comprehensive HIV/AIDS knowledge and informing the design or framing of interventions. This is to ensure that any disparities in how young people comprehend HIV/AIDS knowledge are addressed to achieve desired outcomes. These would mitigate against the one-size-fits-all approach, which has proven ineffective in achieving set targets in empowering young people in the fight against the spread of HIV/AIDS.

This study will use the theory of the Health Belief Model (HBM) and Socio- Ecological Models. These models have been applied in several studies concerning socio-economic aspects contributing to the disparities in comprehensive HIV/AIDS knowledge among various age groups. The models and accompanying theories as well as relevance to the study are explained in more detail below.

The Health Belief Model

The Health Belief Model states that an individual's behaviour related to health is influenced by their perception of the likelihood of sickness and the advantages of preventing it (Glanz, Rimer & Viswanath, 2008; Zainiddinov & Habibov, 2016). That is, the basis of HBM is to predict health behaviour by focusing on the individual's perception of the health threat and the value associated with taking a particular health action (Ban & Kim, 2020). According to Strecher and Rosenstock (1997), the HBM emphasises an individual's perception of health threats and the importance of taking action. Additionally, the HBM tends to be more immediate and context-specific and is concerned with perceived threats and short-term benefits (Ajzen, 1991; Strecher & Rosenstock, 1997).

The HBM has been used in past studies on HIV/AIDS prevention to address HIV/AIDS knowledge, transmission methods, and its myths and facts; hence, it is an essential model in studying comprehensive HIV/AIDS knowledge. Furthermore, the model is used for health promotion and disease prevention programmes and for predicting individual changes in health behaviours (Glanz, Rimer & Viswanath, 2008). This is because it assists in understanding the determining factors of an individual's knowledge and sexual behaviour in each society. Figure 4 below summarises the components of the HBM.

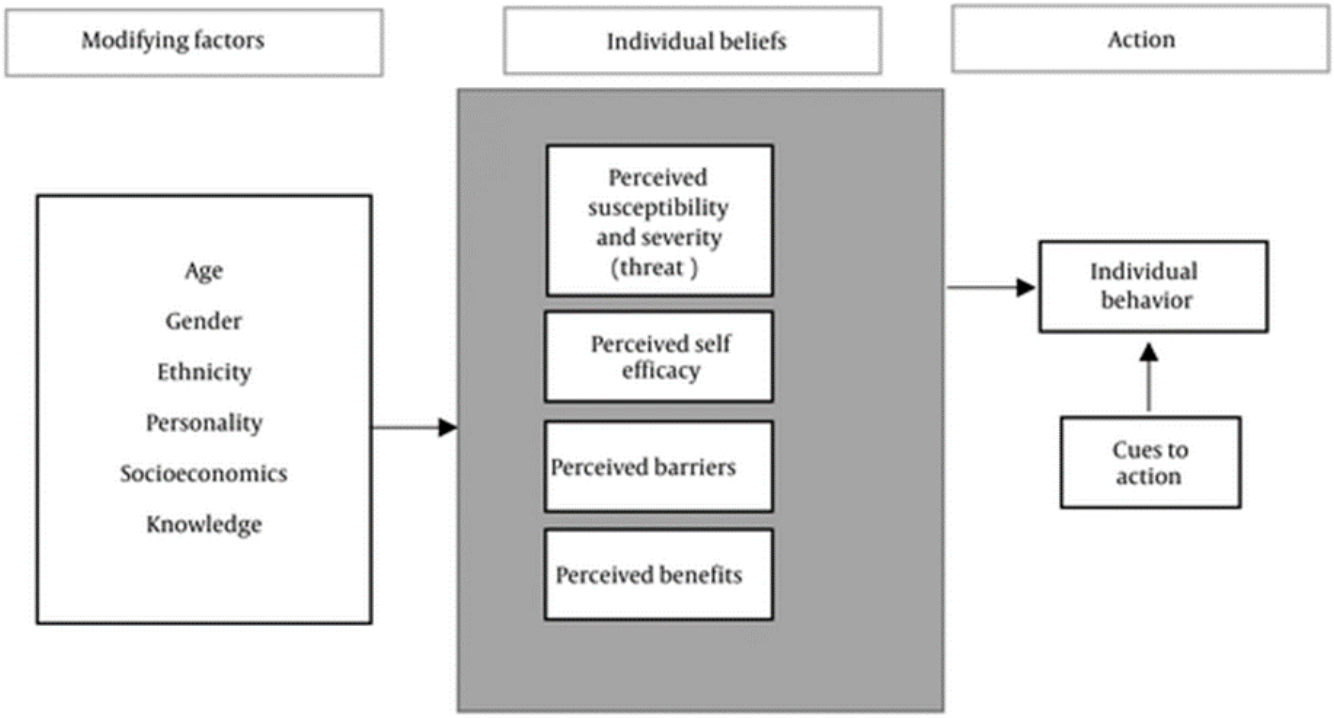

Figure IV Health belief model components and linkages (Glanz et al., 2008)

Components of HBM

According to Becker (1974) and Strecher and Rosenstock (1997), the key components of the HBM are:

1. **Modifying factors:** These are external factors that have the potential to influence a person's decision to take action related to their health. These include knowledge, structural variables and demographic variables.
2. **Perceived susceptibility and severity:** These refer to a person's opinions regarding the possibility and gravity of a health issue.
3. **Perceived benefits and barriers:** These are the differences between the perceived benefits and costs of adopting a health-related action.
4. **Cues to action:** These are external variables that motivate people to act. They include media campaigns, advice from healthcare workers or witnessing an illness in others.
5. **Self-efficacy:** This refers to self-assurance regarding one's capacity to carry out the advised action.

Collectively, these elements aid in the comprehension of how people evaluate health risks, balance the benefits and drawbacks of preventative actions, and ultimately determine whether or not to participate in behaviours that promote health. The HBM makes the crucial assumption that people base their decisions on reasonable assessments. But in reality, social and emotional factors also influence behaviour in addition to cognitive ones. This demonstrates the limitations of the model and the existence of additional variables that may affect health-related behaviour.

One of the HBM's shortcomings is that, despite emphasising personal perspectives and beliefs, it frequently presents a very limited view of health behaviour. Also, it falls short of capturing the intricacy of social, cultural, and environmental dynamics that shape behaviour (Janz & Becker, 1984; Strecher & Rosenstock, 1997). This indicates that a behaviour’s typical larger context is not considered by the HBM. Furthermore, according to Glanz, Rimer and Viswanath (2008) and Janz and Becker (1984), the model emphasises elements at the individual level while paying less attention to environmental factors that can also influence behaviour.

The Socio-Ecological Model

The SEM suggests that there is a structured framework that includes different levels of influence with which to examine how these affect comprehensive knowledge about HIV/AIDS (Bronfenbrenner, 1979). The model is crucial in explaining the relationship between the identified determinants and the outcome variable because it explains how multiple factors influence an individual's health outcome (Bronfenbrenner, 1979). Unlike HBM, which focuses on individual intrinsic factors, it considers individual behaviours and characteristics, relationships, community beliefs and structures, and organizational structures and policies within the areas of residence, all of which work together to influence health outcomes (McLeroy et al.,1988). The various levels indicated in Figure 5 are explained below.

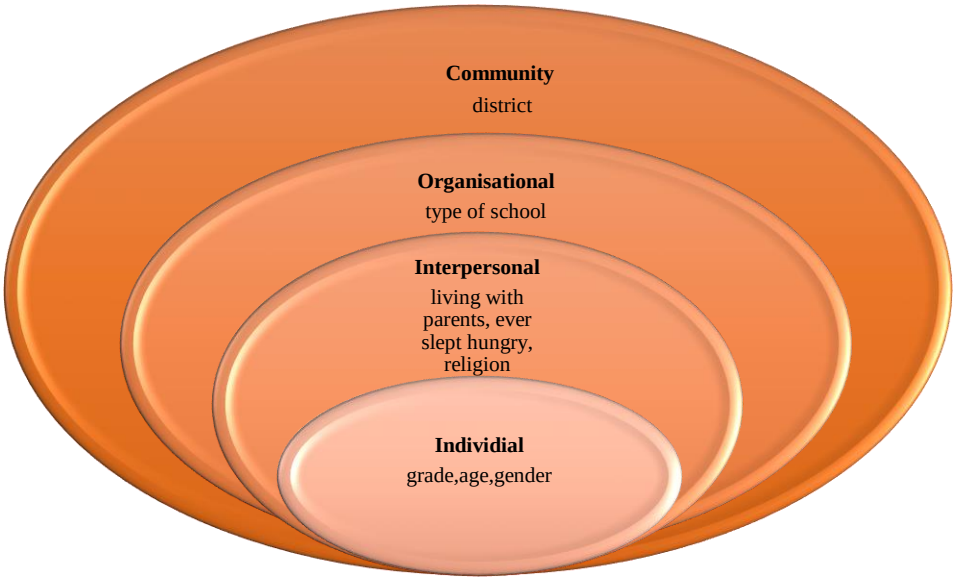

Figure V Socio-Ecological Model as adapted from (Bronfenbrenner,1979)

The various levels of the SEM are;

i. **Community level factors-** In our study, the district in which the student lives is considered a community-level factor. This is because the district in which the school is located can impact the availability and quality of educational and health resources. An example such as the study conducted by Darteh (2020) showed that individuals in the Upper Eastern Region of Ghana with more infrastructure and resources were more likely to have comprehensive HIV/AIDS knowledge compared to individuals in other regions.

ii. **Organisational level factors -** This includes the type of school (public vs. private) the child attends. Private schools might have better resources for comprehensive health education, thus potentially leading to higher levels of HIV/AIDS knowledge among their students (Abiodun et. Al 2014).

iii. **Interpersonal level factors** – These include family structure, socioeconomic status and religion. The level explains that starting a family and parental support in the form of education can have an impact on comprehensive knowledge about HIV/AIDS. Living arrangements with parents can influence social support and communication about health-related issues, potentially increasing awareness and understanding among children. A study by Lima et al. (2020) and Alsubaie (2020) indicated that households with parents with higher levels of education were associated with children with comprehensive HIV and AIDS knowledge. Furthermore, as in the study by Virdausi et al. (2022), religious beliefs to which a child is exposed can influence their level of knowledge about HIV and AIDS

iv. **The individual level factors** – These are personal characteristics such as age, sex and grade. An example is that compared to older children, younger children may not have comprehensive knowledge due to limited exposure to HIV/AIDS education and differences in curriculum content and age-appropriate education (UNICEF, 2021). Also, as stated by Nubed et.al., (2016) compared to males, females do not have comprehensive HIV/AIDS knowledge possibly due to cultural norms and differential access to health information.

A comprehensive examination of these levels of influence in terms of their impact on knowledge about HIV and AIDS will reveal the most influential factors in shaping comprehensive knowledge about HIV/AIDS. Consequently, targeted interventions can be formulated to close knowledge gaps. This allows targeted interventions to be formulated to close knowledge gaps. In addition, the SEM allows researchers to identify targeted interventions at each level to address any socioeconomic inequalities and improve access to healthcare.

Although the SEM is useful for understanding the socioeconomic determinants of comprehensive HIV and AIDS knowledge, it has several limitations. An example is that to fully explain the relationships between explanatory variables and the outcome variable, the relevant data must be available for each level (Glanz & Bishop, 2010). Furthermore, the model does not comprehensively indicate which specific factors are most critical, while the interaction of multiple factors can lead to confounding variables (Diez Roux,

2012). The model also places more emphasis on the external influences and undermines the individual factors in explaining the outcome variable (Stokols, 1996).

Empirical literature review

This section aims to define and quantify comprehensive HIV/AIDS knowledge. Existing literature that has focused on comprehensive HIV/AIDS knowledge, the level of comprehensive HIV/AIDS knowledge, determinants and the dissemination of HIV/AIDS information in different settings will be discussed.

Search Strategy

A systematic search strategy was used in the literature search for this study between March 2022 and February 2024. This strategy included identifying and selecting relevant scientific articles, reports, and datasets from various academic databases such as PubMed, JSTOR, and Google Scholar. Keywords and phrases such as "HIV/AIDS knowledge," "youth," "Botswana," and "secondary data analysis" were used in combination with Boolean operators to refine the search results. The inclusion criteria were set to focus on studies published in the last decade, those conducted in sub-Saharan Africa with a particular focus on Botswana, and those using secondary data. In addition, the reference lists of key articles were examined to identify additional relevant studies, ensuring a comprehensive and informed review of the existing literature.

Comprehensive HIV/AIDS knowledge

During the Special Session of the United Nations General Assembly (UNGASS) on HIV/AIDS in June 2001, member states adopted the Declaration of Commitment on HIV/AIDS (World Health Organisation, 2005). Under this declaration, the core indicators developed applied to all countries aiming to reverse the HIV/AIDS epidemic by 2015, with countries expected to report every four to five years (UNAIDS, 2008). The 13th indicator, from the 2nd category of indicators, allows countries to track incremental progress in comprehensive HIV/AIDS knowledge of young people over time, while in other countries it is used to maintain already existing high levels of knowledge (UNAIDS, 2008). From the recommendations of UNGASS and UNAIDS, the level of understanding of HIV/AIDS should be measured through the identification of myths and prevention strategies (UNAIDS, 2021).

According to the 13th indicator of UNGASS, comprehensive HIV/AIDS knowledge is defined as follows:

"Comprehensive knowledge means understanding that using condoms during sexual intercourse and having only one uninfected faithful partner can reduce the risk of contracting the AIDS virus, understanding that a healthy-looking person can have the AIDS virus, and rejecting the two most common local misconceptions[6] about AIDS transmission or prevention."(UNAIDS, 2021).

Several studies have investigated comprehensive knowledge about HIV/AIDS for individuals of specific age categories, gender and other characteristics using UNGASS guidelines. In the literature, most studies define comprehensive HIV/AIDS knowledge prevalence as the number of people who correctly answered all HIV/AIDS knowledge questions/statements divided by the number of respondents included (UNAIDS, 2008). Determining the prevalence of comprehensive HIV/AIDS knowledge is essential to ensure effective public health planning, targeted interventions, and to contribute appropriately to ongoing efforts to reduce the impact of HIV/AIDS on individuals and communities worldwide. In existing studies, participants' depth of understanding is measured by how many questions they answered correctly about HIV prevention, and their ability to dismiss the myths about the disease (Abiodun et al., 2014). Moreover, socioeconomic determinants to evaluate their association with their comprehensive knowledge of HIV/AIDS are also often assessed.

Having comprehensive knowledge of HIV/AIDS has been attributed to having access to information. A study conducted in Pakistan of 5,673 married women aged between 15 and 49 years, found a comprehensive HIV/AIDS knowledge prevalence rate of 68% (Siddique et al., 2022). According to the study, women from the wealthiest households with moderate access to information had high levels of HIV/AIDS knowledge. Another study conducted in Ghana found a positive association between comprehensive HIV/AIDS knowledge and age (Darteh, 2020). The study found that young women aged between 15 and 24 years reported a significantly lower prevalence rate of comprehensive HIV/AIDS knowledge (women who got all HIV/AIDS knowledge questions correct) of 21.9% (Darteh, 2020). According to Darteh (2020), those with high levels of comprehensive HIV/AIDS knowledge were from areas with many NGOs distributing HIV/AIDS information. Furthermore, a study by Teshale et al. (2021) conducted in 33 countries in Sub-Saharan Africa (SSA), found that the overall comprehensive HIV/AIDS knowledge stood at 56%. Similar to the two studies by Darteh (2020) and Siddique et al. (2022) respectively, the study found that higher levels of education and exposure to mass media were associated

[6] A person should be able to reject the myth that a person gets HIV from mosquito bites and from sharing food with someone who is infected.

with an increased likelihood of knowledge about mother-to-child transmission (MTCT) of HIV/AIDS and its prevention.

Additionally, the association between the prevalence of comprehensive HIV/AIDS knowledge and positive health outcomes has been explored in the literature. A study conducted in four Central Asian countries and two Eastern European countries with 8,532 women aged 15 to 49 years found that lower HIV rates were identified in countries where comprehensive HIV/AIDS knowledge was higher (Zainiddinov & Habibov, 2016).

Some studies also examined the variables that constitute comprehensive HIV/AIDS knowledge. A study by Mandiwa, Namondwe and Munthali (2021) based on young women aged 15–24 years in Malawi found that 42.2% were able to correctly answer the HIV/AIDS knowledge questions. However, the results showed that 25% of these participants did not know that consistent condom use can reduce the risk of contracting HIV/AIDS, while another 25% believed that the disease could be transmitted by mosquitoes. Tetteh et al. (2022) analysed 29 African countries, including some from the SSA region. The study found an overall HIV/AIDS knowledge prevalence of 49.2% for these countries, with Rwanda being the lowest at 23.6%. The HIV/AIDS comprehensive knowledge prevalence rate obtained by Tetteh et al. (2022) was higher than that of Chan and Tsai (2018), who considered thirty-three SSA countries. Their study obtained an HIV/AIDS comprehensive knowledge prevalence rate of 37% with 63% of the participants answering correctly when asked if a person can get HIV from mosquito bites.

Other studies that considered variables that constitute comprehensive knowledge about HIV/AIDS were Murwira et al. (2021) and De Wet, Akinyemi and Odimegwu (2019). The research conducted by Murwira et al. (2021), categorised the responses to HIV/AIDS knowledge questions by undergraduate students in South Africa into different groups. The responses were divided into three groups based on their knowledge of HIV/AIDS which was determined by their performance on 26 yes/no questions. Those in the "poor knowledge" group answered 50% or fewer questions correctly, while those in the "average knowledge" group answered 51% - 74% correctly and those in the "fair knowledge" group answered 75% or more correctly. 21% had very low knowledge of HIV/AIDS, 37% had average knowledge and 42% had fair knowledge. Incorrect answers were mainly found in the statements: "a person can become infected with HIV by sharing a glass of water with an HIV-infected person" (52.5%), "eating healthy foods can protect a person from HIV infection" (64.1%), "all pregnant women are infected with HIV, children are born with AIDS" (53.6%), and "the bite of a mosquito that transmits the virus can cause HIV/AIDS" (63.5%)

(Murwira et al., 2021). In another South African study, results were based on a sample of 4,095,447 adolescents (aged 15 to 24) who knew or cared for someone with HIV/AIDS in South Africa (De Wet, Akinyemi & Odimegwu, 2019). Of this cohort, only 48.13% of the participants knew that medical circumcision reduces the risk of HIV infection in males.

Few studies focusing on comprehensive knowledge of HIV/AIDS have been conducted in Botswana. An example is a study conducted on 393 students at the University of Botswana which found that 96% of students correctly answered all nine HIV/AIDS knowledge questions (Stephens et al., 2012). Another study in Botswana included 609 adults aged 50 years and older (Ama, Shaibu & Burnette, 2016). The results showed that the group had a comprehensive HIV/AIDS knowledge of 95.7%, indicating that the adults had good knowledge about HIV/AIDS. Despite the impressive prevalence rate of comprehensive HIV/AIDS knowledge, there is still a lack of knowledge about HIV infection through blood transfusion, mother-to-child transmission, or sharing needles or syringes (Ama, Shaibu & Burnette, 2016).

Another study in Botswana examined the HIV/AIDS knowledge of 445 college students (Faimau et al., 2016). Unfortunately, despite having comprehensive HIV/AIDS knowledge with a high prevalence rate (90%), some of the students were still uninformed about HIV/AIDS. Furthermore, the analysis of the fourth Botswana AIDS Impact Survey (BAIS IV) survey with 4045 participants aged 15 years and over, revealed that only 38.3% provided correct answers to questions about HIV/AIDS knowledge (Letshwenyo-Maruatona et al., 2019). This low prevalence can be explained by the fact that young people are still unable to recognise misconceptions, as is also supported by the findings of Letamo (2019). Additionally, a study by Majelantle et al. (2014) found that in 2008, only 43% of adolescents and young people (AYP) aged 15-24 years had a comprehensive understanding of HIV/AIDS. This was also confirmed by the UNAIDS assessment in Botswana, which concluded that less than half of adolescent women and teenage girls had a comprehensive understanding of HIV/AIDS-related concepts (UNAIDS, 2019). According to the latest BAIS findings, in 2021, comprehensive understanding of HIV/AIDS in the said cohort had increased to 64%, indicating improvement (Statistics Botswana, 2022).

Reasons for Studying Comprehensive HIV/AIDS Knowledge

The greatest challenge in combating HIV/AIDS is how people see, understand, perceive, and behave in dealing with this disease. With inadequate knowledge about HIV/AIDS, society may continue to face many problems such as discrimination and stigmatisation due to the lack of acceptance of people with

HIV/AIDS (Youssef et al., 2021). The consequences of such discrimination leaves people with HIV/AIDS fearful of disclosing their status, feeling isolated, and even having difficulty accessing antiretroviral therapy (ART) and psychological support (Youssef et al., 2021). Increased stigma due to a lack of knowledge about HIV/AIDS leads to low testing rates because fear hinders the UNAIDS goal of testing people as widely as possible (Sullivan et al., 2020).

Inadequate knowledge about HIV/AIDS has also been identified as a major cause of the spread of the disease (Yaya et al., 2019). This is because inadequate knowledge about HIV/AIDS is directly linked to people's risky sexual behaviour, which increases the likelihood of contracting the disease (Murwira et al., 2021). The key to control and prevent HIV/AIDS is to equip the community with knowledge about this disease (Alhasawi et al., 2019). A better understanding of HIV/AIDS in the community will potentially increase condom use, reduce the number of sexual partners, increase testing rates, increase treatment enrolment, and perhaps reduce mother-to-child transmission. This will improve access and use of HIV/AIDS-related resources available to the population and ensure that universal goals in the fight against HIV/AIDS are achieved.

Modalities of Disseminating HIV/AIDS Information

HIV was first discovered in 1981 by scientists at the Centre for Disease Control and Prevention (Friedland & Klein, 1987). The HIV/AIDS pandemic is considered one of the worst tragedies in modern history due to its far-reaching impact on economic growth and public health. Over 60 million people have reportedly been infected with HIV/AIDS in the last 20 years, posing a serious barrier to long-term human development, particularly in developing countries (Thomson et al., 2016). Moreover, the highest HIV/AIDS mortality rates were recorded worldwide in 2004, with 2 million deaths (UNAIDS, 2022a). Unfortunately, HIV/AIDS-related deaths and new infections continue to disproportionately affect low- and middle-income countries (LMICs) (Alhasawi et al., 2019). This was also reflected in the United Nations Programme on HIV/AIDS (UNAIDS) 2021 infection estimates, which showed that of 1.5 million new infections estimated worldwide, 57% came from Africa (UNAIDS, 2022b). Furthermore, 64.6% of the 650,000 HIV/AIDS deaths worldwide were reported to be from Africa (UNAIDS, 2023).

Botswana is one of the countries most affected by the HIV/AIDS epidemic in SSA. In 2020, Botswana was among the top four most HIV and AIDS-affected countries in the SSA region, behind South Africa, Eswatini and Lesotho (Government of Botswana, 2019). In 2021, UNAIDS Statistics for Botswana

estimated that about 360,000 people were HIV-positive out of a population of just over 2.3 million (UNAIDS, 2021). According to their estimates, 7,200 new infections and 4,600 AIDS-related deaths were also recorded in the same year (UNAIDS, 2021).

In the global HIV/AIDS debates, various authors have attributed biological, socioeconomic and demographic factors to increased HIV/AIDS incidence rates (Nubed & Akoachere, 2016; von Rosen et al., 2018). The determinants cited in various studies as driving the increase in infection rates included wealth disparities, type of treatment systems, gross domestic product per capita, corrupt practices, religion, education levels, contraceptive use, and the availability of antiretroviral drugs (Nubed & Akoachere, 2016; von Rosen et al., 2018). Against this background, numerous initiatives have been developed to combat the spread of HIV/AIDS (Govender et al., 2018). As a result of these initiatives, HIV-related mortality has declined worldwide, particularly in SSA (Govender et al., 2018; Zegeye et al., 2022).

Managing the spread of HIV/AIDS requires ensuring that people have the necessary knowledge from the outset (Ramogola-Masire et al., 2020). There are many ways to obtain HIV/AIDS information, whether the information is correct or incorrect. For example, South Africa found that 64% of high school students heard about HIV/AIDS and its aspects from teachers, and healthcare workers, (Fana, 2021). The other ways in which students heard about HIV/AIDS and its aspects were radio, television and the internet (22%) and family and friends (14%) (Fana, 2021). In Uganda, secondary school students primarily heard about HIV/AIDS from teachers (29.81%), health professionals (27.88%), television and radio (21.15%), and family and friends (19.23%) (Nabisubi et al., 2021). In Nigeria, hospitals (89.7%), schools (88.1%), family members (88%), friends (87.6%), the internet (86.8%) and health discussions are the main sources of good knowledge about HIV/AIDS (81.9%), among others (Oluyemi et al., 2019). The dissemination of HIV messages has evolved significantly over the years, adapting to changes in scientific knowledge, societal attitudes, and communication technologies (Chandran, 2016; Slutkin et al., 2006). To expand reach, new strategies have emerged in addition to traditional communication techniques (Chandran, 2016).

When the illness first surfaced in the early 1980s, the intention was to increase knowledge about it to lessen fear and stigma (Noar & Kennedy, 2009). During this time, traditional media like radio, television, and newspapers were used to spread messages (Glassman, Giedion & Smith, 2017). Governments increased funding for prevention campaigns in the 1990s as more knowledge about the illness became accessible (Slutkin et al., 2006). The main objective of the messages was to emphasise prevention, with a particular focus on promoting safe sexual practices and increasing knowledge of the routes of

transmission (Myhre & Flora, 2000). The promotion of condoms became a crucial component (Myhre & Flora, 2000; Slutkin et al., 2006). During that time, HIV messages targeting particular groups like women and young people were still disseminated through mass media (Glassman, Giedion & Smith, 2017; Slutkin et al., 2006). By the late 1990s, most nations had implemented antiretroviral therapy for HIV-positive individuals. Community-based organisations (CBOs) also provided information on the value of early diagnosis, treatment accessibility, and de-stigmatisation of the illness (Slutkin et al., 2006).

In the early 2000s international organisations such as WHO and UNAIDS were extensively involved in disseminating HIV/AIDS messages. It was also during that period that the internet was widely adopted and used to disseminate messages in addition to print media, radio and television (Noar & Kennedy, 2009). At that time the focus of messages was to reduce stigma, increase testing, increase access to treatment and the promotion of the "ABC" (Abstain, Be Faithful, Condomise) strategy. Digital platforms became prominent in the mid-2000s where campaigns were run through websites and blogs to foster community engagement (Noar & Kennedy, 2009). In the 2010s, both traditional and digital media were still used in disseminating HIV/AIDS messages (Slutkin et al., 2006) and a prevention strategy was developed that emphasised the promotion of PrEP (Pre-Exposure Prophylaxis).

Currently, there are diverse channels for disseminating HIV/AIDS messages such as social media, podcasts and community-based campaigns (Slutkin et al., 2006). The focus of these messages is to address barriers to access to HIV/AIDS interventions and address social determinants of health. Throughout these years, the evolution of HIV messages and modalities of dissemination reflect not only advancements in scientific knowledge but also changing societal attitudes, the impact of advocacy movements, and innovations in communication technologies (Chandran, 2016; Sarma & Oliveras, 2013). The goal has consistently been to reduce stigma, increase awareness, promote prevention strategies, and improve access to testing and treatment (Sarma & Oliveras, 2013) .

In the case of Botswana, over the years, the Botswana government in collaboration with non-governmental organisations, has implemented various strategies to educate people about HIV/AIDS in different contexts. To raise public awareness of HIV/AIDS, several initiatives have been launched, including HIV testing and counselling centres, distribution of information materials, and public health campaigns (Government of Botswana, 2009; Ramogola-Masire et al., 2020). The government started implementing HIV/AIDS education in schools in the late 1990s. With donor assistance, teacher training manuals on HIV/AIDS were created, and teachers received capacity building on how to provide students with

comprehensive HIV/AIDS education (Botswana Ministry of Education, 2005; World Health Organization, 2008). Peer education programmes were also developed, to equip older students with the knowledge and skills necessary to educate their younger peers about the virus (Botswana Ministry of Education, 2005). In addition, to give accurate information about the disease, local CBOs would organise awareness workshops for the public and students (Ramogola-Masire et al., 2020). Brochures, pamphlets and other educational materials were widely distributed to ensure that people had reliable information on HIV/AIDS (Ramogola-Masire et al., 2020).

Botswana has experienced the development of HIV/AIDS dissemination channels. The public today is primarily informed about HIV/AIDS through social media and online platforms, either by the government or non-governmental organisations (Chandran, 2016). Additionally, online support groups, podcasts, webinars, and mobile applications have become well-known platforms that agencies use in disseminating data, news, and personal accounts (Chandran, 2016; Taggart et al., 2015). Typically, social media is used to spread HIV/AIDS messages, particularly to young people (Chandran, 2016).

Although HIV/AIDS communication has evolved to make information more comprehensive and accessible, there are still risks that need to be addressed. Firstly, not every young person has access to the internet due to their socioeconomic status (Sarma & Oliveras, 2013). Furthermore, despite the abundance of information available online, some of it may be false or misleading, which could affect young people's understanding of HIV/AIDS (Kuppuswamy & Narayan, 2010). This was confirmed by a study by Garett and Young (2022) whose results suggested that misinformation about treatment adherence spread through social media was high among who believed they could stop treatment if they felt better.

Measurement of Comprehensive HIV/AIDS Knowledge

In the literature, the most used tool for measuring comprehensive knowledge is the one developed based on the recommendations of UNGASS and UNAIDS, which states that the level of understanding of HIV/AIDS should be measured by identifying myths and prevention strategies. According to Agegnehu et al. (2020), Budu et al. (2022), Ochako et al. (2011) and Teshale et al. (2021), the most common questions used in measuring comprehensive HIV/AIDS knowledge are:

1. Can one get HIV by witchcraft or supernatural means?
2. Can one reduce the risk of getting HIV/AIDS by using condoms during sex?

3. Can one reduce the risk of getting HIV by having one sex partner only?
4. Can one get HIV from mosquito bites?
5. Can one get HIV by sharing food with a person who has HIV/AIDS?
6. A healthy-looking person can have HIV?

This tool assumes that one has comprehensive knowledge if they answer "yes" to questions 2, 3, and 6 and "no" to questions 1, 4 and 5. Otherwise, one is considered not knowledgeable if at least one of the responses to the questions is incorrect.

Other studies added additional questions such as transmission through breastfeeding, kissing and the HIV status of the individual (Kodyalamoole & Badiger, 2021). Kodyalamoole and Badiger (2021) examined questionnaires consisting of 26 HIV knowledge questions containing statements about general knowledge about HIV/AIDS, its transmission and prevention (Murwira et al., 2021). Murwira et al. (2021) also used the 26 HIV/AIDS knowledge questions covering basic HIV/AIDS knowledge, HIV transmission, and HIV prevention knowledge, requiring respondents (who were students) to choose between yes and no, with only one correct answer. Based on Bloom's cut-off point grading system, HIV/AIDS knowledge was categorised as "poor" (a score of 50% or less), "average" (51 - 54%), and "knowledgeable" (75% and above) (Murwira et al., 2021). When analysing the results, the authors categorised HIV knowledge into "knowledgeable" and "non-knowledgeable" by combining poor knowledge and average knowledge into "not knowledgeable". One of the benefits of using the aforementioned technology is that it allows for an in-depth examination of various aspects of HIV/AIDS knowledge, including transmission, prevention, treatment and misconceptions, thus providing a detailed understanding of an individual's level of knowledge. Moreover, the questionnaire can cover a wide range of topics, making it easy to identify specific areas where knowledge gaps exist. However, the disadvantage of such a methodology is that long questionnaires can lead to respondent fatigue which can negatively impact the quality of the responses. Furthermore, analysing the answers from a long questionnaire can be a complex and time-consuming process.

In a study conducted in Botswana by Ama, Shaibu and Burnette (2016), their tool consisted of four items: HIV/AIDS knowledge, knowledge about HIV transmission, prevention and control and associated risk factors. Another study, based on the BAIS survey, used a tool consisting of seven questions related to HIV/AIDS transmission and prevention, to which participants were required to disagree or agree to

demonstrate understanding (Letshwenyo-Maruatona et al., 2019). A total score of HIV/AIDS knowledge was obtained by summing item responses. In the studies conducted by Ama, Shaibu and Burnette (2016) and Letshwenyo-Maruatona et al. (2019), the smaller number of questions led to a high probability of a high response rate.

In a different study, Laari and Alhassan (2022), used eleven items to assess HIV knowledge, where responses were coded as 1 for "yes" and 0 for "no" and the overall HIV knowledge score was a summation of the correct responses. If a person scored 5 or less, they were considered to have poor knowledge levels. If they scored six or more points, they were considered to have a good level of knowledge (Laari & Alhassan, 2022). This is different from the computation strategy that was adopted by Teshale et al. (2021), Budu et al. (2022), Agegnehu et al. (2020) and Ochako et al. (2011). The data analysis method of Laari and Alhassan (2022) has similar setbacks to those mentioned above due to the limited number of questions in the questionnaire. Additionally, binary answers can oversimplify the complexity of knowledge about HIV/AIDS, making it difficult to determine different levels of understanding of a particular topic. In contrast, the utilisation of binary responses allows participants to be categorised into those who have correct knowledge (1) and those who do not (0), facilitating standardisation of the assessment process.

Determinants of Comprehensive HIV/AIDS Knowledge

To identify the determinants of comprehensive HIV/AIDS knowledge, the literature is geographically classified into "outside Africa," "Africa," and "within Botswana." A summary of previous research is presented in tables and the results are discussed, highlighting similarities and differences to other studies.

Factors Associated with Comprehensive HIV/AIDS Knowledge Outside Africa

Table 3 below provides an overview of studies conducted outside Africa that identified determinants of comprehensive HIV/AIDS knowledge. This has been limited to the global South due to the limited number of studies conducted in the global North. The table shows the authors and year of publication, type of data used, participants description, dependent variables, independent variables, main results and study limitations for each study.

Table 3. Summary of Predictors of Comprehensive HIV/AIDS Knowledge Outside Africa

Authors (Year)	Type of Data Used	Participants Description	Variables	Main Data Analysis Methods	Significant/Insignificant Predictors	Study Limitation
Iqbal et al. (2019)	Secondary data: Pakistan Demographic and Health Survey 2012-2013	13,558 ever-married women aged 15–49 years in Pakistan.	*Dependent variable*: Women's Comprehensive HIV/AIDS knowledge (high and low knowledge) *Independent variables:* Region (location), Geographical classification (urban/rural), Age, Educational Status, Husband's education Status, Occupation, Husband's occupation, Exposure to mass media, Wealth Index, Autonomy and Attitude to wife beating.	Chi-square test, binary logistic regression and multivariable regression.	*Significant predictors:* Region, Age, Educational Status, Occupation, Husbands occupation, Exposure to mass media, Wealth Index, Attitude to wife beating. *Insignificant predictors*: Geographical classification, Husbands' education status, Autonomy	• Survey only focused on women
Alhasawi et al. (2019)	Primary data	346 senior students in Kuwait.	*Dependent variable*: Total knowledge (Continuous) *Independent variable:* Gender, Nationality, Grade, Specialty.	Mann-Whitney's U and Kruskal-Wallis tests	*Significant predictors:* Gender, Nationality, Specialty. *Insignificant predictors:* Grade	• Small sample size

Authors (Year)	**Type of Data Used**	**Participants Description**	**Variables**	**Main Data Analysis Methods**	**Significant/Insignificant Predictors**	**Study Limitation**
Son et al. (2020)	Secondary data: Vietnam Multiple Indicator Cluster Survey 2014	9,827 women aged 15–49 years in Vietnam.	*Dependent variable*: Women's Comprehensive HIV/AIDS knowledge (Higher and lower knowledge) *Independent variables:* Age, Marital status, Area, Ethnicity, Education, Socioeconomic status, Ever tested for HIV/AIDS, Knows where to test for HIV/AIDS.	Chi-square test and Multivariable logistic regression.	*Significant predictors:* Age, Education, Socioeconomic status, ever tested for HIV/AIDS, knows where to test for HIV/AIDS. *Insignificant predictors:* Marital status, Area, Ethnicity.	• Underestimation or overestimation of the proportion of comprehensive knowledge • Study cannot be generalised to other settings
Achachagua et al. (2022)	Primary data	294 undergraduate students in Peru.	*Dependent variable*: Student's Comprehensive HIV/AIDS knowledge (Adequate and inadequate knowledge) *Independent variables*: Age, Attitude towards sexuality.	Chi-square test and Spearman's correlation statistics.	Significant predictors: Attitude towards sexuality. Insignificant predictors: Age	• Small sample size
Virdausi et al. (2022)	Secondary data: Indonesian Demographic	25,895 women aged	*Dependent variable*: Women's Comprehensive HIV/AIDS knowledge	Chi-square test, Binary logistic regression	*Significant predictors:* Age, Education level, Wealth index, Resident, Region of residence,	• Study focused on women only

Authors (Year)	Type of Data Used	Participants Description	Variables	Main Data Analysis Methods	Significant/Insignificant Predictors	Study Limitation
	and Health Survey 2017	15–49 years in Indonesia.	(poor and good knowledge) *Independent variables:* Age, Education level, occupation, Head of household, Wealth quintile, Area of residence, Region of residence, Access to information, Mobile phone, Autonomy, and Women's attitudes against Wife-beating.	and multivariable regression.	access to information, Autonomy, and Women's attitudes against wife-beating. *Insignificant predictors:* Occupation, Head of household, Mobile phone, Autonomy.	
Bhowmik and Biswas (2022)	Secondary data: UNICEF Multiple Indicator Cluster Survey 2019	64,346 women aged between 15 and 49 years in Bangladesh.	*Dependent variables*: Heard of HIV/AIDS, Knowledge of HIV/AIDS Transmission, knowledge on the misconception about HIV/AIDS (All measured on Yes or No)	Binary logistic regression	*Significant predictors*: Education, Wealth index, Education of house head, Media exposure, Owning mobile phone. *Insignificant predictors*: Age, Area of residence, Age of house head, Gender of house head.	• Insufficient data to assess health literacy

Authors (Year)	Type of Data Used	Participants Description	Variables	Main Data Analysis Methods	Significant/Insignificant Predictors	Study Limitation
			Independent variables: Age, Education, Wealth index, Area of residence, Age of house head, Gender of house head, Education of house head, Media exposure, Owning mobile phone.			
Lima et al. (2020)	Secondary data was collected between March and April 2016 from the Belém state school system.	Secondary school students from the Belém state school, Brazil	*Dependent variable:* HIV/AIDS knowledge level *Independent variables:* fathers' and mothers' educational levels, family income	Chi-square and Binary logistic regression	*Significant predictors:* Father's and mother's educational levels, family income	• Sample size limited to school going children in a private school
Alsubaie (2020)	Primary data	Male adolescents aged between 15 and 20 years in Saudi Arabia	*Dependent variable:* HIV and STI-related knowledge (Good and poor) *Independent variables:* Age, School type, Father's	Binary logistic regression	*Significant predictors:* Father's and mother's educational level. *Insignificant predictors:* Age, School type	• Due to cultural taboos, adolescent students in middle school were not included in this study. • For political and cultural reasons, adolescent female students were not included in the study.

Authors (Year)	Type of Data Used	Participants Description	Variables	Main Data Analysis Methods	Significant/Insignificant Predictors	Study Limitation
			education level, and Mother's education level.			• Some questions such as type of sexual behaviours and homosexuality were not asked. • Findings from this study could not be generalised to the whole country.
Pachuau, Tannous and Agho (2021)	National Family Health Survey Fourth Series (NFHS-4) 2015–2016 dataset	Adults aged 15-49 years in Mizoram, Northeast India	*Dependent variable:* *Independent variables:* Age, educational level, religion, wealth status, literacy, exposure to media, tribe and area of residence, marital status, working status, and migration status.	Chi-square and Binary logistic regression	*Significant predictors:* Age, educational level, religion, wealth status, literacy, exposure to media, tribe and area of residence *Insignificant predictors:* Marital status, working status, migration status,	

Error! Reference source not found. above shows that different authors use different data analysis methods when analysing determinants of comprehensive HIV/AIDS knowledge. In their study conducted in Pakistan, Iqbal et al. (2019) used the chi-square test to test the association between women's comprehensive HIV/AIDS knowledge and predictors, and the results showed that all predictors were statistically significant. In addition, they conducted binary logistic and multivariable regression to examine whether these associations were significant (Iqbal et al., 2019). Although some predictor variables were associated with women's comprehensive HIV/AIDS knowledge, their association was insignificant. The study results showed that women's comprehensive HIV/AIDS knowledge was not dependent on geographical classification and husband's occupations (Iqbal et al., 2019).

Moreover, Iqbal et al. (2019) discovered that compared to women under 25 and over 34, women aged 25 to 34 had more thorough knowledge about HIV/AIDS. Furthermore, compared to women with only primary education or less, women with secondary education or higher knew more about HIV/AIDS. Additionally, compared to women working in the agricultural sector, employed and unskilled women had a more thorough knowledge of HIV/AIDS (Iqbal et al., 2019).

Alhasawi et al. (2019)'s showed in their study results that gender, nationality and speciality have an influence on comprehensive knowledge about HIV/AIDS. In contrast, grade has no influence on comprehensive knowledge of HIV/AIDS, as indicated in Table 3 (Alhasawi et al., 2019). Furthermore, Alhasawi et al. (2019) found that male students had comprehensive knowledge about HIV/AIDS compared to female students. In addition, non-Kuwaiti citizens had higher knowledge about HIV/AIDS than Kuwaiti citizens. The results showed that knowledge about HIV/AIDS is not associated with education, which contrasts the findings from Iqbal et al. (2019), who showed that knowledge about HIV/AIDS is associated with education. The results also showed that students who specialised in science had higher knowledge than those who studied arts.

Son et al. (2020) applied Chi-square and multivariable logistic regression to identify factors associated with comprehensive knowledge about HIV/AIDS in their study conducted in Vietnam. The results were similar to those of Iqbal et al. (2019), who found that age, education, and socioeconomic status/wealth index were associated with comprehensive HIV/AIDS knowledge. However, geographic classification, marital status, and ethnicity were not associated with comprehensive HIV/AIDS knowledge. Similar to the results of Iqbal et al. (2019), the 20- to 24-year-old age group had more comprehensive HIV/AIDS knowledge than those under 20 and those over 24. In addition, the results showed that affluent women with secondary education who have ever tested for HIV and know where

to test have more comprehensive HIV/AIDS knowledge compared to women in other groups. In contrast to Son et al. (2020)'s results in Vietnam, Achachagua et al. (2022) conducted a correlation study and found that age was not associated with knowing about HIV/AIDS in Peru. However, Achachagua et al. (2022) found that the more knowledge about HIV/AIDS, the lower the likelihood of engaging in risky sexual behaviour.

Virdausi et al. (2022) also used the same methods as Iqbal et al. (2019), in which chi-square and multivariable logistic regression were applied to understand the association between comprehensive HIV/AIDS knowledge and socio-economic and demographic factors among women in Indonesia. Results showed that occupation, head of household, access to television, and women's attitudes toward wife beating had no significant association with comprehensive HIV/AIDS knowledge. These results differed from Iqbal et al. (2019), who found that women's occupations and attitudes toward wife beating were significant. However, both studies found that age, education level, and exposure to mass media (Internet, newspaper, and radio) had an impact on women's comprehensive HIV/AIDS knowledge. Differences were also noted in Iqbal et al. (2019) and Son et al. (2020) studies, which show that comprehensive HIV/AIDS knowledge does not depend on a woman's place of residence, however Virdausi et al. (2022) study indicated that women in urban areas had higher levels of knowledge than women in rural areas.

Other important findings from Virdausi et al. (2022), showed that women aged 25 years and older, those with secondary or secondary education, and wealthier women who used information (internet, newspaper and radio) at least once a week and had mobile phones were more likely to do so compared to other cohorts knowledge suffered from HIV/AIDS. Additionally, women with higher autonomy had more comprehensive HIV/AIDS knowledge than other women in other categories. Regarding age, Virdausi et al. (2022) agreed with Iqbal et al. (2019) that younger women under the age of 24 generally lacked comprehensive HIV/AIDS knowledge. Based on education, Iqbal et al. (2019), Son et al. (2020), and Virdausi et al. (2022) agreed that the higher the education level, the better a person's comprehensive HIV/AIDS knowledge.

In their study conducted in Bangladesh, Bhowmik and Biswas (2022) divided knowledge about HIV/AIDS into three categories. These were: heard of HIV/AIDS, knowledge of HIV/AIDS transmission, and knowledge of misconceptions about HIV/AIDS, all of which had "yes" or "no" responses. From their results, using binary logistic regression, only respondent education, education of head of household, media exposure, and ownership of a cell phone were associated with all three HIV/AIDS knowledge categories. Hearing about HIV/AIDS, knowledge about HIV/AIDS

transmission, and knowledge about misconceptions about HIV/AIDS improved as education increased, highlighting that the better the education, the higher the knowledge. This finding was similar to that of Iqbal et al. (2019), Son et al. (2020) and Virdausi et al. (2022).

Among younger people (25 years and younger), age was associated with knowledge about HIV/AIDS and HIV/AIDS transmission, but not with knowledge of misconceptions about HIV/AIDS. Age was also not associated with higher knowledge about hearing about HIV/AIDS and lower knowledge about HIV/AIDS transmission. Bhowmik and Biswas (2022) agreed with Iqbal et al. (2019), Son et al. (2020) and Virdausi et al. (2022) that as individuals' wealth index status improves, their knowledge of HIV/AIDS also increases. In addition, living in urban areas, exposure to the media, and owning a cell phone increased hearing about HIV/AIDS, knowledge about HIV/AIDS transmission, and knowledge about misconceptions about HIV/AIDS.

In a study by Lima et al. (2020) in Brazil focusing on HIV/AIDS knowledge, the results suggest that the HIV/AIDS knowledge of male and female secondary school students depends on the educational level of their fathers and mothers. Family income was also an important indicator for female students. Using binary logistic regression, Alsubaie (2020) found in Saudi Arabia that male adolescents' HIV/AIDS knowledge was associated with the father's and mother's education level, not age and school type. Lima et al. (2020) and Alsubaie (2020) male adolescents are more likely to have a thorough knowledge of HIV/AIDS if their parents have higher educational levels. Pachuau, Tannous and Agho (2021) in India's findings found that knowledge about HIV/AIDS among people aged 15 to 49 years was associated with age, education level, wealth status, literacy, media exposure and place of residence.

From the above literature, the variables that influence people's knowledge about HIV/AIDS in the Global South are in most cases age, educational status, socioeconomic status and media exposure, as well as ownership of mobile phones. In addition, studies in the Global South have focused on women aged 15 to 49, while less attention has been paid to school-aged children in lower grades.

Factors Associated with Comprehensive HIV/AIDS Knowledge in Africa

Error! Reference source not found. provides an overview of studies conducted on comprehensive knowledge of HIV/AIDS in African countries. Predictors associated with comprehensive HIV/AIDS knowledge were also examined. Only studies published between 2019 to 2022 were included in order to provide the most current literature on the topic. Since such studies have historically not been common in Africa compared to the Global North, recent studies provide improved data quality and

methodological rigor, ensuring the reliability and validity of our analysis. However, some work before 2018 was also taken into account Additionally, by focusing on studies conducted from 2018 onwards, researchers can ensure that their results are current, relevant, and reflect the current state of knowledge about HIV/AIDS and its associated factors in Africa.

Table 4. Summary of Predictors of Comprehensive HIV/AIDS Knowledge in Africa

Authors (Year)	Type of Data Used	Participants Description	Variables	Main Data Analysis Methods	Significant/Insignificant Predictors	Study Limitations
Debalkie, Fentahun and Fetene (2019)	Secondary data: Ethiopian Demographic and health survey 2016.	5929 young women aged 15-24 years in Ethiopia.	*Dependent variable*: Comprehensive HIV/AIDS knowledge (Yes/ No) *Independent variables:* Media exposure, Residence (urban/rural), Age, Education level, Religion, Wealth index, Marital Status, and Occupation.	Univariate and multivariable binary logistic regression.	*Significant predictors:* Media exposure, Age, Education level, religion, and Wealth index. *Insignificant predictors:* Residence, Marital Status, Occupation.	• Study limited to females
Tarkang, Lutala and Dzah (2019)	Primary data	294 senior school students aged 15–24 years in Ghana.	*Dependent variable*: Students' HIV/AIDS knowledge (good and poor knowledge) *Independent variables:* Age, Sex, Religion, School, Ethnicity group,	Univariate and multivariable binary logistic regression	*Significant predictors:* Religion, School, Ethnicity group, Marital status. *Insignificant predictors:* Sex, Grade level.	• Study cannot be generalised to other regions due to being restricted to only three schools in the western region of Ghana • Small sample size • Study concentrated only on knowledge as the primary

Authors (Year)	Type of Data Used	Participants Description	Variables	Main Data Analysis Methods	Significant/Insignificant Predictors	Study Limitations
			Marital status, and Grade level.			factor in explaining HIV transmission among young people • Study failed to explore other variables relevant to sexual behaviour in youths, such as some attitudes, the age of sexual debut and high personal HIV risk perception.
Enatama and Akpobasa (2020)	Primary data	394 students aged 15 to 18 years in Nigeria.	*Dependent variable*: Students' HIV/AIDS knowledge (low, moderate and high knowledge) *Independent variables:* Age, Sex, Religion, School composition, Ethnicity group, Awareness of HIV/AIDS, and Grade level.	Chi-square tests.	*Significant predictors:* Age, School composition. *Insignificant predictors:* Religion, Ethnicity group, Awareness of HIV/AIDS, Grade level.	• Small sample size

Authors (Year)	**Type of Data Used**	**Participants Description**	**Variables**	**Main Data Analysis Methods**	**Significant/Insignificant Predictors**	**Study Limitations**
Ali (2020)	Primary data	324 randomly selected nursing students in Egypt	*Dependent variable*: Students' HIV/AIDS knowledge (good and poor knowledge) *Independent variables:* Grade level, Gender, Pre-university education, Residence, Fathers' education, and Mothers' education.	Multivariable binary logistic regression.	*Significant predictors:* Gender *Insignificant predictors:* Grade level, Pre-university education, Residence, Fathers' education, and Mothers' education.	• Small sample size
Mandiwa, Namondwe and Munthali (2021)	Secondary data: Malawi Demographic and Health Survey 2015-16	10,422 among adolescent girls and young women (AGYW) in Malawi.	*Dependent variable*: AGYW' comprehensive HIV/AIDS knowledge (Knowledgeable and Not knowledgeable) *Independent variables:* Age, Education, Marital status, Region, Residence, Household wealth status, Religion, Frequency of listening to the radio, and Ever tested for HIV.	Chi-square tests, Univariate binary logistic regression and Multivariable binary logistic regression.	*Significant predictors:* Education, Marital status, Region, Household wealth status, frequency of listening to the radio, and ever tested for HIV. *Insignificant predictors:* Residence, Religion, Ever tested for HIV.	• Study omitted males

Authors (Year)	**Type of Data Used**	**Participants Description**	**Variables**	**Main Data Analysis Methods**	**Significant/Insignificant Predictors**	**Study Limitations**
Murwira et al. (2021)	Primary data	345 students at the University of Venda, South Africa	*Dependent variable*: Students' comprehensive HIV/AIDS knowledge (Knowledgeable and Not knowledgeable) *Independent variables:* Age, Gender, Race, Level of Study, Field of Study, Religion.	Chi-square tests.	*Significant predictors:* Race, Field of study, Religion. *Insignificant predictors:* Age, Gender, Level of study.	• Results cannot be generalised to other regions as the study is restricted to one university • Small sample size
Kawuki et al. (2022)	Secondary data: Rwanda Demographic and Health Survey 2020	3258 adolescent girls aged 15 to 19 years in Rwanda	*Dependent variable*: Adolescent girls' comprehensive HIV/AIDS knowledge (Knowledgeable and Not knowledgeable) *Independent variables:* Age, Education level, Working status, Marital status, Religion, Health insurance coverage, History of STI, Exposure to newspapers, Exposure to radio, Exposure to	Univariate and multivariable binary logistic regression	*Significant predictors:* Education level, Religion, Health insurance coverage, and Exposure to Television. *Insignificant predictors:* Age, Working status, Marital status, Religion, History of STI, Exposure to newspapers, exposure to Radio, and Contraceptive use.	• Study limited to females

Authors (Year)	Type of Data Used	Participants Description	Variables	Main Data Analysis Methods	Significant/Insignificant Predictors	Study Limitations
			Television, and Contraceptive use.			
Laari and Alhassan (2022)	Secondary data: Ghana Multiple Indicator Cluster Survey 2017/18.	Ghanaian women aged 15 years and above.	*Dependent variable*: Women's comprehensive HIV/AIDS knowledge (Poor knowledge level and Good knowledge level) *Independent variables:* Age, Attended school, Area, Marital status, Religion, Ethnicity, Health insurance, Functional difficulty, Wealth index, exposure to newspapers, Exposure to radio, Exposure to computer or tablet, and exposure to the internet.	Chi-square, univariate and multivariable binary logistic regression.	*Significant predictors:* Age, Attended school, Religion, Health insurance, Functional difficulty, Wealth index, Exposure to radio, Exposure to computer or tablet, and exposure to the internet. *Insignificant predictors:* Area, Marital status, Ethnicity, and Exposure to newspapers.	• Study limited to females
Nkoka, Ntenda and Chuang (2021)	Secondary data: Malawi Demographic and health	Women of reproductive-aged 15-49 years in Malawi	*Dependent variable;* HIV/AIDS knowledge (Good or poor) *Independent Variable;* Age, educational level,	Spearman's correlation, Chi-square, multivariate	*Significant variables:* Age, educational level, educational status, employment status, wealth status, distance to	• Variable computation (categorising outcome variable) may have led to

Authors (Year)	Type of Data Used	Participants Description	Variables	Main Data Analysis Methods	Significant/Insignificant Predictors	Study Limitations
	survey 2015-16		educational status, employment status, wealth status, distance to health facilities, ethnicity and media exposure, Marital status, Religion, Ethnicity, Residence, Region, Community Education, Community Employment, Community wealth, Community distance to health facilities, Community media exposure	binary regression.	health facilities, ethnicity, region, and media exposure *Insignificant predictors:* Marital status, Religion, Ethnicity, Residence, Region, Community education, Community employment, Community wealth, Community distance to health facilities, Community media exposure	some important information being lost
Adesina, Olufadewa and Oladele (2022)	Secondary data: Nigeria National Demographic Health Survey 2018.	Women in south-west Nigeria aged 15-49 years	*Dependent variable;* HIV/AIDS knowledge (Good or poor) *Independent Variable;* age, educational level and partners' educational level, parity, marital status.	Chi-square, Multivariate binary regression.	*Significant predictors:* age, educational level and partners' educational level. *Insignificant predictors:* parity, marital status.	• Study limited to females

Authors (Year)	**Type of Data Used**	**Participants Description**	**Variables**	**Main Data Analysis Methods**	**Significant/Insignificant Predictors**	**Study Limitations**
Kene et al. (2021)	Primary data	Undergraduate students at Madda Walabu University, Ethiopia	*Dependent variable;* HIV/AIDS knowledge (Good or poor) *Independent Variable:* Origin of residence, the field of study, year of study, monthly income and drug use, Smoke cigarette, tried a range of different drugs, ever had watched pornography, age.	Multivariate binary regression.	*Significant predictors:* field of study, year of study, monthly income and drug use. *Insignificant predictors:* Origin of residence, Smoke cigarette, tried a range of different drugs, ever had watched pornography, age.	• Study results cannot be generalised to the general population since it was restricted to one university

Debalkie, Fentahun and Fetene (2019)'s study in Ethiopia suggests that media exposure (such as newspapers, radio, and television), higher levels of education, and a higher socioeconomic status increase the chances of comprehensive HIV/AIDS knowledge. On the other hand, place of residence, marital status and occupation did not influence the level of knowledge about HIV/AIDS. Likewise, Bhowmik and Biswas (2022), Iqbal et al. (2019) and Debalkie, Fentahun and Fetene (2019) concluded that place of residence does not influence HIV/AIDS knowledge, but rather an individual's education, media exposure, and wealth index.

Similarly, Tarkang, Lutala and Dzah (2019) also conducted univariate and multivariable binary logistic regression to identify predictors of comprehensive HIV/AIDS knowledge among high school students aged 15–24 years in Ghana. Their results indicated that age, gender, and grade level had no influence on students' knowledge, which contradicted the findings of Debalkie, Fentahun and Fetene (2019), who found that age and grade/education level were important predictors of knowledge about HIV/AIDS. In addition, religion, school and ethnic groups influenced knowledge about HIV/AIDS.

Alternatively, Enatama and Akpobasa (2020) categorised HIV knowledge in Nigeria into low, medium and high knowledge levels depending on the number of correct answers provided by respondents. Results showed that only age and school composition were associated with students' HIV/AIDS knowledge. Nevertheless, it was concluded that students' HIV/AIDS knowledge increased with age, supporting the findings of Debalkie, Fentahun and Fetene (2019). These contradict the results of Tarkang, Lutala and Dzah (2019), who concluded that age does not affect students' HIV/AIDS knowledge. A possible reason for the variation is that one of the limitations of Tarkang, Lutala and Dzah (2019)'s study revealed that the sample size could not be generalised to the population. This meant that the results may have been underestimated and therefore, inaccurate.

In a study in Egypt, Ali (2020) examined the influence of education, including that of parents, along with students' gender on comprehensive HIV/AIDS knowledge. The results showed that men had better knowledge than women based on the odds ratio obtained from binary logistic regression. These results differed from those of Tarkang, Lutala and Dzah (2019) and Enatama and Akpobasa (2020), who found that gender had no association with students' HIV/AIDS knowledge. In addition, it was found that grade level, pre-university education, place of residence, and father's and mother's education did not influence students' HIV/AIDS knowledge.

Mandiwa, Namondwe and Munthali (2021) in Malawi found that AGYW who have higher education were married, wealthy in terms of household wealth, listened to the radio a lot, and had been tested for HIV/AIDS had higher HIV/AIDS knowledge than others. These results are consistent with Debalkie, Fentahun and Fetene (2019) and Bhowmik and Biswas (2022) in terms of place of residence, media exposure, education and wealth status. However, the results differed from those of Son et al. (2020) and Virdausi et al. (2022), who found that age influences women's comprehensive HIV/AIDS knowledge.

Virdausi et al. (2022) in South Africa aimed to examine the determinants of comprehensive HIV/AIDS knowledge among university students in South Africa. According to the results, students with the following characteristics: coloured/mixed race, studying health or social sciences or law or management, and belonging to a traditional religion had higher chances of having better knowledge about HIV/AIDS compared to black students studying math, science, environmental science or education and are Christian believers respectively. The results of Murwira et al. (2021)'s study supported those of Tarkang, Lutala and Dzah (2019), which concluded that age, gender, and grade variables were unrelated to students' HIV knowledge.

Kawuki et al. (2022)'s study in Rwanda aimed to examine factors associated with HIV/AIDS knowledge among adolescent girls in Rwanda. Their results found that age, marital status, work status, history of sexually transmitted diseases, newspaper and radio consumption, and contraceptive use were not associated with adolescent girls' HIV/AIDS knowledge. Instead, adolescent girls with secondary school education, Protestant believers, health insurance coverage, and those who watched television had higher HIV/AIDS knowledge than girls in other categories. These results are similar to those of Mandiwa, Namondwe and Munthali (2021), who found that marital status and radio listening frequency were unrelated to adolescent girls' HIV/AIDS knowledge. Furthermore, educational level, but not class level, was also crucial for adolescent girls' HIV/AIDS knowledge (Mandiwa, Namondwe & Munthali, 2021; Murwira et al., 2021).

Key findings from the study by Laari and Alhassan (2022) in Ghana found that women aged 25 to 34 years, who were in school and had health insurance, were well off socioeconomically, listened to the radio frequently, and had computer and tablet access to the internet had better HIV/AIDS knowledge. Nkoka, Ntenda and Chuang (2021)'s study was carried out in Malawi among women of childbearing age. According to their findings, HIV/AIDS knowledge in this cohort was associated with age, education level, educational status, wealth status, distance to health facilities,

ethnicity, and media exposure. In Nigeria Adesina, Olufadewa and Oladele (2022) found that urban women's comprehensive HIV/AIDS knowledge was associated with age, education level, and partner education level. Furthermore, Kene et al. (2021) in Ethiopia applied bivariate and multivariable logistic regression. They found that undergraduate students' HIV/AIDS knowledge was associated with major, year of study, monthly income, and drug use.

Factors Associated with Comprehensive HIV/AIDS Knowledge in Botswana

Recent literature that focuses on comprehensive HIV/AIDS knowledge is scarce in Botswana, particularly among students. Due to this limitation, we revised the search restriction of 2019 to 2022 articles and covered all relevant literature, including old publications, on condition that they aligned with the topic of interest. Table 5 summarises the available literature on this topic in Botswana. A discussion of findings from these selected articles follows the table.

Table 5. Summary of Predictors of comprehensive HIV/AIDS Knowledge in Botswana.

Authors/Year	Type of Data Used	Participants Description	Variables	Main Data Analysis Methods	Significant/ Insignificant Predictors	Study Limitations
Letshwenyo-Maruatona et al. (2019)	Secondary data: Botswana AIDS Impact Survey IV 2013	4045 participants aged 15 years and older	*Dependent variable*: HIV/AIDS knowledge and stigma (Continuous) *Independent variables:* Age, Gender, Marital status, Education level, Employment, Religion, HIV/AIDS test, and Risky behaviour.	Independent-T test, ANOVA and multiple linear regression	*Significant predictors:* Age, HIV/AIDS test. *Insignificant predictors:* Gender, Marital status, Education level, Employment, Religion, and Risky behaviour.	• Data not disaggregated by age or grade
Letamo (2019)	Secondary data: Botswana AIDS Impact Survey IV 2013	2134 adolescents aged 10–19 years.	*Dependent variable*: Misconceptions about HIV transmission (Yes/No) *Independent variables:* Sex, Age, Education, Religion, Residence, Marital status	Chi-square and multivariable binary logistic regression	*Significant predictors:* Education, Residence. *Insignificant predictors:* Sex, age, religion, residence, and marital status.	• Hypothetical questions used to measure misconceptions

Authors/Year	Type of Data Used	Participants Description	Variables	Main Data Analysis Methods	Significant/ Insignificant Predictors	Study Limitations
Majelantle et al. (2014)	Secondary data: Botswana Youth Risk Behaviour Surveillance survey conducted in Botswana in 2009	3763 school-going children aged 10 to 19 years	*Dependent variable*: Knowledge (knowledgeable and Not knowledgeable *Independent variables:* Sex, Age, Education, Religion, Residence	Bivariate and multivariate analyses	*Significant predictors*: age, education, residence, religion *Insignificant predictors:* Sex	-
Ama, Shaibu and Burnette (2016)	Respondent-driven sampling (RDS) between June 2014 and December 2014 in Botswana	609 older adults	*Dependent Variable:* General knowledge of HIV (Very high knowledge, high knowledge and low knowledge) *Independent variables:* Age, employment status, highest education level, marital status, level of income, type of residence, study area, sex	Multivariate logistic regression analysis	*Significant predictors:* **knowledge of transmission** - age, marital status and employment status **knowledge of prevention** - sex **control methods** - sex *Insignificant predictors:* **knowledge of**	• Study focused only on older adults

Authors/Year	Type of Data Used	Participants Description	Variables	Main Data Analysis Methods	Significant/ Insignificant Predictors	Study Limitations
					transmission -, highest education level, level of income, type of residence, study area **knowledge of prevention and control methods -** highest education level, marital status, level of income, type of residence, study area	

Letshwenyo-Maruatona et al. (2019) showed that age and HIV/AIDS testing were the only variables associated with HIV/AIDS knowledge. Thus, the other explanatory variables, namely, gender, marital status, education level, employment, religion, and risky behaviour were not associated with the outcome variable. The study concluded that the 24-35 age group has higher levels of HIV/AIDS knowledge than other age groups, which is consistent with the findings of Iqbal et al. (2019). However, the results differ from those of Mandiwa, Namondwe and Munthali (2021), who found that education and religion play a role in knowledge about HIV/AIDS.

Although Letamo (2019)'s study appears to be similar to this study, the main distinction lies in the datasets that were utilised in both studies. Furthermore, this study adjusts for factors such as region, school and class which have often been overlooked in previous studies. Letamo (2019)'s findings show that education level and place of residence were the only factors associated with adolescents' misconceptions about HIV transmission. The results also showed that adolescents with primary education or less and people living in rural areas had higher misconceptions about HIV transmission than adolescents with secondary education and people living in urban areas. These results are consistent with Debalkie, Fentahun and Fetene (2019) regarding Letshwenyo-Maruatona et al. (2019), who concluded that education level is a significant determinant of knowledge about HIV/AIDS. Regarding place of residence, the results of Letamo (2019) differ from those of Iqbal et al. (2019) and Debalkie, Fentahun and Fetene (2019), who found that HIV/AIDS knowledge was not related to place of residence. In addition, Letamo (2019) showed that gender, age, religion, and marital status were not related to adolescents' misconceptions about HIV transmission.

Other studies that examined factors associated with HIV knowledge include Majelantle et al. (2014) and Ama, Shaibu and Burnette (2016). Based on their results, Majelantle et al. (2014) found that adolescents aged 14 years and older, in primary school and older (similar to Letamo (2019), who had never had sexual intercourse and had only one partner had higher knowledge about the connection between HIV and AIDS. The results also showed that high school youth and Christians had higher knowledge about HIV transmission and prevention than others.

The findings of Ama, Shaibu and Burnette (2016), which focused on adults aged 50 years and above, showed that as people age, knowledge of HIV/AIDS transmission methods and prevention and control methods also increased. However, knowledge about the risks associated with HIV/AIDS was decreasing. Furthermore, knowledge of the risks associated with HIV/AIDS was not associated with employment

status. However, knowledge about the transmission routes of HIV/AIDS was higher among the employed, while knowledge about HIV/AIDS prevention was lower among the employed compared to the unemployed. Education level, marital status, income, and gender were also found to be associated with knowledge of HIV/AIDS transmission methods, prevention and control methods, and knowledge of HIV/AIDS-related risks.

Conclusion

Our examination of HIV/AIDS knowledge through the HBM has provided critical insights into the determinants, sources, and measurement methods associated with this important study area. The HBM has proven instrumental in explaining how individuals' perceptions of susceptibility, severity, benefits, and barriers influence their motivation to acquire and maintain knowledge about HIV/AIDS. By strategically addressing these factors, interventions can effectively improve understanding, promote awareness of associated risks, and promote proactive engagement in preventive measures.

The literature review highlighted various channels through which people acquire knowledge about HIV/AIDS and emphasised the need for comprehensive education strategies. Despite diverse sources, a widespread lack of knowledge was evident across all countries reviewed, highlighting the urgency of targeted interventions to combat discrimination and stigma. Furthermore, a lack of knowledge about HIV/AIDS has been linked to risky sexual behaviour, making it necessary to investigate this as there is still limited research in this area in Botswana.

The examination of methodologies used to measure HIV/AIDS knowledge uncovered a common trend of categorising individuals into binary outcomes, such as "knowledgeable" or "non-knowledgeable." This prevalent approach, while offering simplicity, underscores the need for a more nuanced understanding of knowledge levels. Addressing this gap in measurement methodologies can contribute to a more comprehensive evaluation of HIV/AIDS knowledge and inform targeted intervention.

Analysis of statistical methods for modelling factors related to comprehensive knowledge of HIV/AIDS revealed different approaches and cautioned against generalisations. Consistent influencing factors such as age, gender, education level and socioeconomic status emerged, but their effects varied depending on the context. Our conclusion recognises the nuanced nature of these determinants and highlights the need for context-specific interventions and policies.

Despite the comprehensive analysis, the inherent limitations of the research highlight the challenges in generalising findings. Our study, focusing on Botswana's school-age children (aged 13 to 19 years), and incorporating covariates examined by previous researchers, contributes to the nuanced understanding of the factors associated with comprehensive HIV/AIDS knowledge in this specific population. By acknowledging this complexity, our findings aim to support targeted interventions and policies, promote healthier behaviours, and ultimately contribute to the broader discourse on HIV/AIDS knowledge

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PART C - JOURNAL MANUSCRIPT

ANALYSING THE SOCIO-DEMOGRAPHIC DETERMINANTS OF COMPREHENSIVE HIV/AIDS KNOWLEDGE AMONG SCHOOL-GOING CHILDREN IN BOTSWANA: A MULTI-LEVEL ANALYSIS

Abstract

Background: Young people in Botswana are increasingly exposed to HIV due to a lack of understanding about the disease, leading to risky sexual behaviours and stigma and reluctance to seek prevention services.

Objectives: The purpose of this study is to determine the level of comprehensive HIV/AIDS knowledge among Botswana's school-age children and the associated sociodemographic determinants.

Method: Secondary data collected from the 2015 Botswana Youth Risk Behavioural and Biological Surveillance Survey II survey was used for the analysis. Multilevel mixed effects logistic regression was used to identify the predictors of comprehensive HIV/AIDS knowledge. The model includes individual level, school and regional factors.

Results: The overall prevalence of comprehensive HIV/AIDS knowledge was estimated at 58.6%, 95% CI: (57.4% - 59.7%). Females, younger adolescents and Christian students were likely to have more knowledge. Students who suffered from hunger were likely to be less informed than those who were well-fed. Students who lived with their parents during school holidays were more informed. Students in grades 9 to 12 had higher odds of having comprehensive knowledge than those in grade 8 while surprisingly, older students had lower odds of comprehensive knowledge. Private school students had more knowledge than public school students.

Conclusion: Students in Botswana have limited knowledge about HIV/AIDS, which is influenced by factors such as school type, age, class and religion. There is a need for frameworks that guide the dissemination of appropriate information across all platforms.

What this study adds: The use of multi-level analysis accounts for intra-cluster correlations in ascertaining the determinants of comprehensive HIV/AIDS knowledge.

Keywords: Botswana, Knowledge, awareness, HIV/AIDS, adolescents, young people,

Introduction

Since its emergence in 1981, the human immunodeficiency virus/acquired immunodeficiency syndrome (HIV/AIDS) has been one of the most devastating disasters in modern history. Since the first case in 1985, around 400,000 people in Botswana have lost their lives to the disease (UNAIDS, 2022). At its peak, the United Nations Development Programme (UNDP) estimated that there were 100 new infections per day in 1997 and that 332,000 cases would be reported in the country by the year 2000 (Farrow, 1999; Phaladze & Tlou, 2006). In 2020, Botswana was among the four most HIV-affected countries in the Sub-Saharan African (SSA) region, behind South Africa, Eswatini and Lesotho (Government of Botswana, 2019). In 2021, the United Nations Programme on HIV/AIDS (UNAIDS) Statistics for Botswana estimated that approximately 15% of its population was HIV positive (UNAIDS, 2021). They also estimated that 7,200 new infections and 4,600 AIDS-related deaths were recorded in the same year (UNAIDS, 2021).

The causes of an increase in HIV infections are attributed to biological, socioeconomic and demographic factors (Nubed & Akoachere, 2016; von Rosen et al., 2018). To address these issues, various measures have been taken to reduce HIV transmission. These include education campaigns for prevention, the introduction of HIV treatment, the expansion of testing services and the promotion of measures to reduce mother-to-child transmission (Govender et al., 2018; Nubed & Akoachere, 2016; UNAIDS, 2019; Zegeye et al., 2022). These have led to a global decline in HIV-related mortality, including in Botswana. Although overall mortality rates are decreasing, there is an emerging trend of increasing new infections among young people worldwide (Government of Botswana, 2019; World Health Organisation, 2022). In 2018, Botswana recorded a significant increase in new HIV infections among adolescents and young people aged 15 to 24 years (UNICEF, 2021). The Fifth Botswana AIDS Impact Survey (BAIS V) also supported this finding by highlighting that new infection rates are concentrated among this group (Statistics Botswana, 2022).

The foregoing provides evidence for the existence of gaps in the adolescent HIV care cascade, which includes HIV diagnosis, linkage to and retention in treatment, adherence to antiretroviral therapy (ART), and viral load suppression (Enane et al., 2018; Statistics Botswana, 2022). Obstacles that have led to these gaps include testing restrictions, particularly for minors, as set out in the Public Health Act 2013. According to the law, there is an obligation on the Minister of Health to ensure that confidential HIV testing facilities are available to all persons aged 16 and above (Ministry of Health, 2013). This has become a barrier and have created an aversion to testing for those younger as these restrictions indicate the need for parental or guardian permission for young people to be tested (UNICEF, 2017). As a result, relatively few people are diagnosed with HIV, and HIV-positive people often do not participate in ART programmes because they do not know that they have HIV (Ministry of Health, 1993). Consequently, there is no reliable data on the proportion of HIV-positive adolescents who are currently receiving antiretroviral therapy or are virally suppressed (UNICEF, 2017).

Another crucial point is the comprehensive level of knowledge young people have about HIV/AIDS. Despite extensive research on the topic, school-aged adolescents in Botswana continue to lack a clear understanding of HIV/AIDS, which promotes risky sexual behaviour (Letamo, 2019; Ministry of Basic Education, 2016). In 2008, only 43% of adolescents and young people (AYP) (15–24years) had a comprehensive understanding of HIV/AIDS in Botswana (Majelantle et al., 2014). The 2018 UNAIDS assessment in Botswana also confirmed this finding, concluding that fewer than half of adolescent women and teenage girls had a comprehensive understanding of HIV/AIDS-related concepts (UNAIDS, 2019).

These estimates show that many young people in Botswana have limited knowledge about HIV/AIDS (Ministry of Basic Education, 2016). This could be attributed to negative attitudes and beliefs toward HIV/AIDS, as well as widespread belief in myths about transmission of the disease (Letamo, 2007; Letamo, 2019; Majelantle et al., 2014). In addition, misinformation spread through myths can hinder rational decisions and appropriate behaviour regarding HIV/AIDS and lead to risky sexual behaviour (Letamo, 2019; UNAIDS, 2014).

As a result, young people have become one of the priority populations in Botswana's national response to HIV/AIDS. Against this background, various interventions have been developed for adolescents and young people to prevent new infections, some of which are aimed at education

and awareness (Government of Botswana, 2019; Thomson et al., 2016). For adolescents to access and utilise these HIV/AIDS-related interventions, a better understanding of the disease and its causes is needed (Tavoosi et al., 2004; UNAIDS, 2019).

The aim of this study is to investigate the level of comprehensive HIV/AIDS knowledge among school children in Botswana as well as to examine the determinants of comprehensive HIV/AIDS knowledge or lack thereof among the students. The results of this study will provide guidance on where interventions should be directed to address gaps in HIV/AIDS knowledge. This study will update the old estimate of the level of comprehensive HIV/AIDS knowledge among adolescents and young people (AYP) in Botswana, thereby providing a more up-to-date picture of the situation. The last estimate was in 2008, more than 10 years ago

Theoretical framework

The Health Belief Model

The health belief model (HBM) states that an individual's health behaviour is influenced by their perception of the likelihood of sickness and the advantages of preventing it (Glanz, Rimer & Viswanath, 2008; Zainiddinov & Habibov, 2016). That is, the basis of the HBM is to predict health behaviour by focusing on the individual's perception of the health threat and the value associated with taking a particular health action (Ban & Kim, 2020).

The framework has been crucial in research involving comprehensive HIV/AIDS knowledge as it has been used in previous HIV/AIDS prevention studies to examine HIV/AIDS knowledge, transmission methods, and its myths and facts (Najarkolaei et al., 2009). This is because, knowledge plays an important role in each component of the HBM, influencing individuals' perceptions, beliefs, and actions related to health (Glanz, Rimer & Viswanath, 2008). Therefore, the framework explains determinants of knowledge about HIV/AIDS by examining how individual components influence health-related behaviour as knowledge guides individuals to make informed decisions and preventive actions related to HIV/AIDS. Below are examples of how knowledge plays a role under each component of the HBM:

1. **Perceived Susceptibility:** When individuals have accurate information about HIV/AIDS, they can assess how vulnerable they are to becoming infected with the virus.

2. **Perceived Severity:** Understanding the long-term effects of HIV/AIDS impacts how individuals perceive the severity of the disease
3. **Perceived Benefits:** Knowledge of the benefits of various HIV prevention measures, such as consistent use of condoms or testing influences their use. This promotes healthy sexual behaviour.
4. **Perceived Barriers:** Lack of accurate information can lead to perceived barriers such as fear of accessing services or self-stigmatisation, while accurate awareness provides solutions to perceived barriers.
5. **Cues to Action:** Exposure to relevant and accurate information through various media can encourage individuals to make informed decisions such as starting treatment or getting tested.
6. **Self-Efficacy:** With information, individuals will likely be confident to execute a behaviour.
7. **Modifying Variables:** Socioeconomic or demographic factors play a role in determining the educational level of individuals. Factors such as economic conditions can increase a person's access to more education and therefore influence health outcomes.

Given the above components, HBM provides the basis for examining how individuals recognise and respond to health-related information, including HIV information (Semungus, Tafese & Semella, 2017).

The Socioecological Model

The SEM is another framework that can be used to examine the association between sociodemographic determinants and specific health outcomes. The SEM accounts for numerous degrees of influence, while many other models use tightly defined frameworks (Dyson et.al., 2018). Additionally, SEM states that people's health outcomes in this case comprehensive HIV/AIDS knowledge is a product of mutual interactions within and between their social and physical surroundings (Bronfenbrenner, 1979). These levels are individual, interpersonal, organizational, community and political. Below is an example of how each level plays a role on comprehensive HIV/AIDS knowledge in the context of this study.

v. The community level factors include the district in which the school is located. Location is crucial as it will determine proximity availability of resources that enhance HIV/AIDS knowledge.
vi. Organizational level factors, include the type of school (public vs. private) the child attends. The type of schools further speaks to availability of resources that enhance learning.
vii. Interpersonal factors such as family set up, socio-economic background and religion can impact comprehensive HIV/AIDS knowledge.
viii. Individual-level characteristics such as age, gender, and grade level are believed to play a role in an individual's level of comprehensive HIV/AIDS knowledge.

By examining these levels of influence, the results can reveal the most influential factors in shaping comprehensive HIV/AIDS knowledge. Consequently, targeted interventions can be formulated to close knowledge gaps

Methods

Setting

The data used in this analysis is from a survey that was conducted in 135 private and public schools in Botswana in the ten districts overseen by the Ministry of Basic Education. Data was collected between February and April 2015 (Ministry of Basic Education, 2016).

Study Design

The data used in this study is from the 2015 Botswana Youth Risk Behavioural and Biological Surveillance Survey (BYRBBSS-II). Stratified multistage sampling was used to select schools and classrooms for participation in the study (Ministry of Basic Education, 2016). The school was the primary sampling unit (first stage), while the classroom was the secondary sampling unit (second stage) (Ministry of Basic Education, 2016). First, the student population was stratified by school district, while schools were selected based on their enrolment size and a list of classes of each sampled school was organised by grade level (grade 8,9,10,11 and 12) (Ministry of Basic Education, 2016). Schools were selected using a sampling frame derived from the 2014 master list

of school enrolment data provided by the Ministry of Basic Education (MBE) (Ministry of Basic Education, 2016).

Study Population

Students were eligible to participate in the study if they regularly attended secondary school, were in grades 8 to 12, had permission from their parents or legal guardians to participate, and gave informed consent and assent (Ministry of Basic Education, 2016). Of a total of 9,590 students eligible to be included in the study, 7,564 (78.9%) provided informed consent or assent and agreed to participate in the survey (Ministry of Basic Education, 2016). Those who did not provide informed consent or assent were not included in the study (Ministry of Basic Education, 2016). The ages of survey participants ranged from 13 to 19 years for both males and females (Ministry of Basic Education, 2016).

After data cleaning, a total sample of 6,676 students in the 10 school regions was included in the final analysis. 23 schools were excluded from the analysis because there were less than 20 students surveyed in each school (Figure 1). Having more than 20 students surveyed at each school was important to ensure that the estimates and standard errors were accurate at all levels for the 135 participating schools. Consequently, only 112 schools were included in the analysis. Table 1 shows the distribution of schools by school region.

Figure 1: Flowchart of students included in the analysis

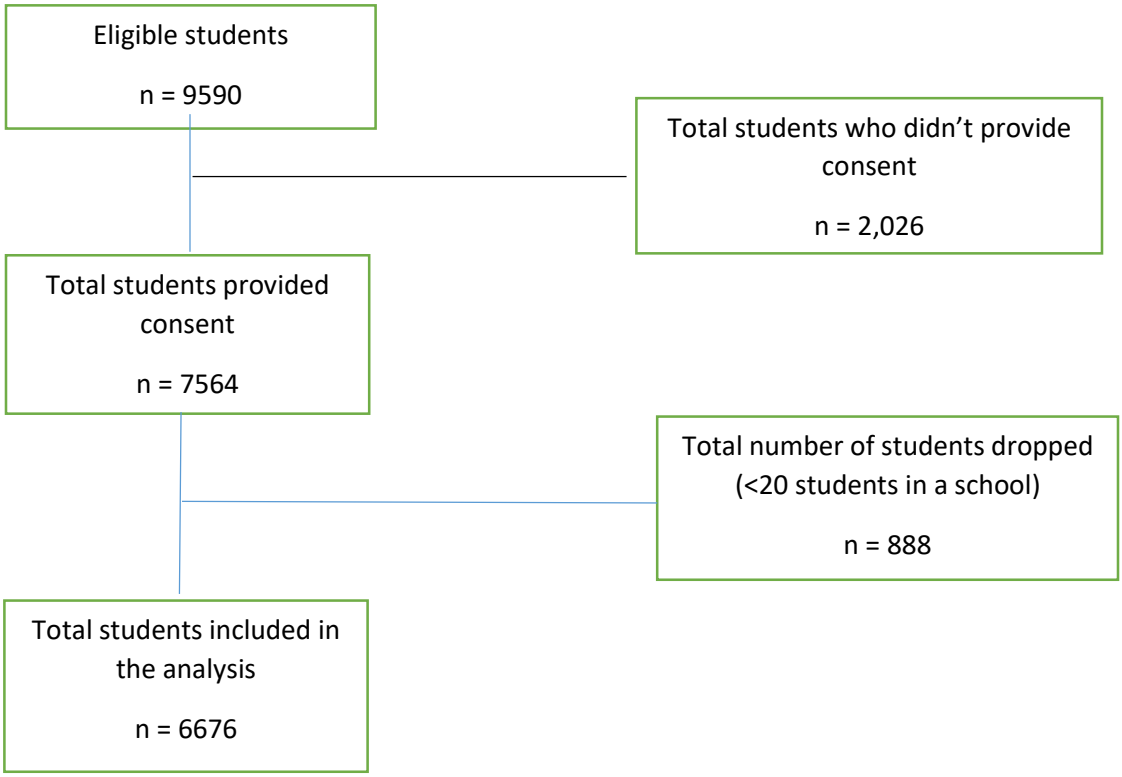

Table 1 Distribution of schools by school regions

Regions	Number of schools	Number of students
Central	27	1081
North East	10	548
Chobe	2	301
Ghanzi	5	733
South East	14	672
Kgalagadi	6	576
Kgatleng	10	837
Kweneng	20	1092

North West	10	468
Southern	8	368
Total	**112**	**6676**

Variables of the study

Outcome variable

The outcome variable for this study was comprehensive HIV/AIDS knowledge, which is a composite score of the following 5 questions:

1. Q82: Can HIV prevention be reduced by having sex with only one faithful, uninfected partner? (Yes/No)
2. Q83: Do you think that a healthy-looking person can be infected with HIV? (Yes/No)
3. Q85: Can a pregnant woman infected with HIV transmit the virus to her unborn child? (Yes/No)
4. Q86: What can a pregnant woman with HIV do to reduce the risk of transmission of HIV to her unborn child? (categorised as "Enroll in PMTCT and take medication" and "Do nothing")
5. Q87: Can a woman with HIV transmit the virus to her new-born child through breastfeeding? (Yes/No)

For each question, the correct answer was given a score of "1" while the incorrect answer was scored a "0". The aggregate scores were applied as an outcome variable, namely the HIV prevention awareness score. This variable ranges from 0 to 5, where a perfect score of 5 indicates complete knowledge of HIV prevention, and a lower score indicates low HIV prevention awareness, in line with the UNGASS 13th indicator reporting criteria. Thus, in this study, comprehensive HIV/AIDS knowledge is a dummy variable with value 1 if the respondent got a perfect score of 5, and zero otherwise.

Independent variables

The independent variables of this study were categorized as individual and contextual-level variables. The individual-level factors included were age (categorised as 13-14 and 15-19 years), sex (male or female), religion (Christianity or other religious affiliation), experience hunger in the past 30 days (yes or no), living with a parent during school term (yes or no) and ever tested for HIV (yes or no). The study used experiences of hunger and living with a parent during school as indicators of SES. Various studies such as the study by Gunderson et al. (2009) used food insecurity as an indicator of lower SES. Furthermore, McLanahan and Sandefur's (1994) study used family structure as a proxy for SES. In their study non-traditional family structures were associated with SES. Additionally, the age categorization was adopted from study done by Diaz, T. et., (2021) and it was deemed appropriate as it takes into account education milestone and risky behaviour. The contextual school-level factors included were grade level (Form 1 to Form 5), and school type categorised as public and private. In Botswana, Form 1 to Form 5 is generally to equivalent to grades 8 to 12 internationally. The contextual region-level variables were not included since the BYRBBSS-II dataset did not have variables at this level available to use for the analysis.

Data Analysis

Stata version 14.0 software was used to clean, recode, and conduct the overall analysis. A multilevel mixed-effects logistic regression analysis was applied because the BYRBBSS-II data has a hierarchical structure that violates the independent assumptions of the standard logistic regression model. For this study, data were organised in groups at different levels: students/pupils, schools, and regions (see Figure 3). Observations were obtained on students (level 1) nested within schools (level 2), and schools nested within regions (level 3).

In the final sample, missing data for independent variables varied between 0 and 0.48%, and no missing values were found in the outcome variable. A complete case analysis was considered appropriate as missingness was less than 5% (Montelpare et al., 2020; Pepinsky, 2018). Furthermore, since missingness was only observed for independent variables, a complete case analysis was appropriate (Montelpare et al., 2020; Pepinsky, 2018).

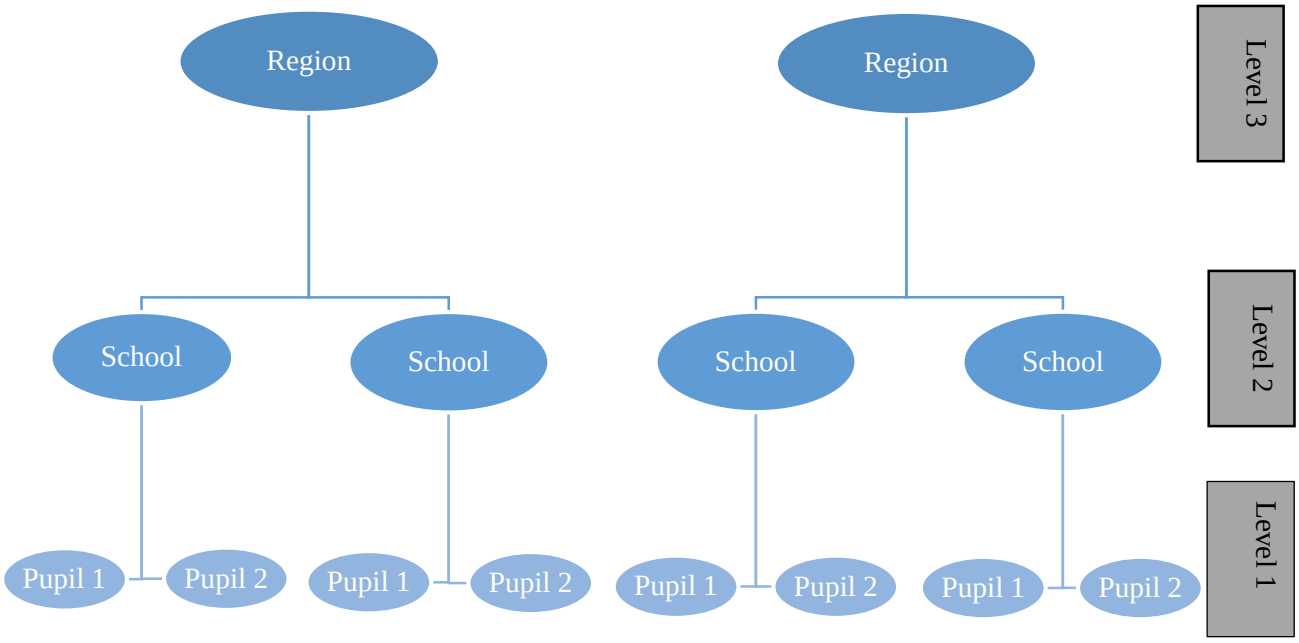

Figure 2: Hierarchical data structure (3 levels)

A three-level mixed-effects logistic regression model was specified to estimate both independent (fixed) effects of the explanatory variables and contextual-level random effects of comprehensive knowledge of HIV/AIDS. The log of the probability of having comprehensive knowledge of HIV/AIDS was modelled using a three-level multilevel model as follows (Goldstein, 1991);

$$\log\left[\frac{\pi_{ijk}}{1-\pi_{ihk}}\right] = \alpha + \sum_m \beta_m x_{mijk} + \sum_{l=1}^{l=3} \gamma_l z_{lijk} + v_k + \upsilon_{jk} + \varepsilon_{ijk} \qquad (1)$$

Where i refers to the student (level 1), j *and* k refer to the school (level 2) and region (level 3), respectively; $x_{mijk}$is the m^{th}fixed effect covariate measured on the i^{th} student in the j^{th} school in the k^{th}region; π_{ijk} is the probability of having comprehensive knowledge of HIV/ AIDS for the i^{th} student in the j^{th} school in the k^{th}region respectively. α refers to the intercept; z_{likj} are the covariates corresponding to the random effects, measured on the i^{th} student in the j^{th} school in the k^{th}region; $\beta_m$are the fixed effects regression coefficients or parameters, while γ are the random effects. The random variable distribution $v_k \approx N(0, \sigma_v^2)$, $v_{jk} \approx N(0, \sigma_u^2)$ and $\varepsilon_{ijk} \approx N(0, \sigma_e^2)$ are assumed to be independent across levels.

The estimates of regional and school-level variances were used to calculate intra-class correlation coefficients (ICC) to examine the extent to which comprehensive HIV/AIDS knowledge is clustered within regions (or schools within regions). The intra-school (p_u) and intra-region (p_v) correlation coefficients are, given by respectively.

$$p_u = \frac{\sigma_u^2 + \sigma_v^2}{\sigma_v^2 + \sigma_u^2 + \sigma_e^2} \text{ and } p_v = \frac{\sigma_v^2}{\sigma_v^2 + \sigma_u^2 + \sigma_e^2}.$$

A stepwise regression approach was used by introducing the explanatory variables to the models in successive stages to establish potential pathways of the determinants. The first model (Model I) was fitted without covariates (only the random school and region effects included). The second model (Model II) was fitted using individual-level variables. Model III was fitted with individual and contextual school factors.

To assess the school and regional level variability of comprehensive knowledge about HIV/AIDS (for random effect analysis), ICC was calculated. In general, ICC is expected to decrease as more covariates that explain some of the variance at the individual level are added (Bosker & Snijders, 2011). A likelihood ratio test was used to test whether the multi-level logistic regression is significantly different from the corresponding standard logistic regression. To verify model fitness, AIC was used, and the model with the best-fit was the model with the lowest AIC.

Results

Socio-demographic characteristics

As shown in Table 2, 58.31% of the respondents were female. 65.70% of the respondents were aged between 15-19 years old and 87.47% were affiliated with Christianity. Approximately 79.79% of the students were in grade 8 to grade 10 (i.e., junior secondary school), and 96.45% were enrolled in public schools. Moreover, 59.01% of the students had experienced hunger in the past 30 days. Overall, comprehensive HIV and AIDS knowledge was estimated at 59%.

Table 2 Socio-demographic characteristics of respondents BYRBBS-2015 (n = 6, 676)

Variable	Unweighted frequency	Unweighted percentage (%)
Sex		
Male	2,781	41.69
Female	3,889	58.31
Age (years)		
13-14 years old	2,290	34.30
15-19 years old	4,386	65.70
Religion		
Christianity	5,838	87.47
Other (Badimo, no religion, Islam, traditional)	836	12.53
School type		
Public	6, 439	96.45
Private	237	3.55
Hunger in the past 30 days		
Yes	3,933	59.01
No/Never	2,732	40.99
Lives with parent during school term		
Yes	3,815	57.22
No	2,852	42.78
Ever tested for HIV		
Yes	2,595	39.15
No	4,033	60.85
Grade		
Form 1	1,589	23.91

Form 2	1, 905	28.66
Form 3	1,809	27.22
Form 4	782	11.76
Form 5	562	8.45
School type		
Public	6, 439	96.45
Private	237	3.55

Please note, that the percentages reported in Table 2 are not adjusted by sample weight of the survey

Prevalence of comprehensive knowledge of HIV/AIDS

Table 3 shows the prevalence of comprehensive HIV/AIDS knowledge among adolescents. The overall prevalence of comprehensive HIV/AIDS knowledge was estimated at 58.6%, 95% CI: (57.4% - 59.7%).

Table 3 Prevalence of Comprehensive HIV/AIDS knowledge and their corresponding 95% CI & SE

Proportion	**Standard Error (SE)**	**95% Confidence Interval (CI)**	
		Lower Bound	**Upper Bound**
0.585	0.01	0.574	0.597

Multilevel logistic regression analysis of comprehensive knowledge about HIV/AIDS

Model comparison, selection, and random effect analysis.

Likelihood ratio tests in ***Table 4*** are significant, indicating that the multilevel model is more appropriate to our context than standard logistic regression models. The ICC in Model I (model with random intercepts of level 3 and level 2 only) indicates that about 2% and 13% of the variability in comprehensive HIV/AIDS knowledge was attributed to regional and school-level variability respectively. The ICC in Model II (which includes individual-level variables) indicates that 12% and 1% of the variation in comprehensive HIV/AIDS knowledge were accounted for by

differences across the school level and regional-level, respectively. The estimated total variance in Model III (include individual-level variables and contextual-school factors) were 0.05 for region level and 0.09 for school level. Regarding the model fitness, Model III was the best-fitting model since it had the lowest AIC (***Table 4***). This model was therefore used to assess the key factors associated with comprehensive knowledge of HIV/AIDS among students (***Table 5***).

Table 4 Random effect analysis for factors associated with comprehensive HIV/AIDS knowledge among students (n = 6,676)

Parameter	Model I	Model II	Model III
Region- level variance	0.06 (0.05)	0.04 (0.04)	0.05 (0.03)
School- level variance	0.42 (0.08)	0.39 (0.07)	0.09 (0.03)
Region-ICC	0.02	0.01	0.02
School-ICC	0.13	0.12	0.04
Model Comparison			
Likelihood-Ratio-chi2-Test	440.16***	335.66***	79.08***
AIC	8624.43	8304.21	8099.51

*Note: ***p-value < 0.001; standard errors in parentheses. Model I - no covariates controlled for; Model II – controlling for individual variables only and Model III – controlling for individual-level variables and contextual-school factors.*

Fixed effects analysis

Table 5 shows adjusted odds ratios. In the multilevel analysis (i.e., after adjusting for level 1 and school contextual factors), sex, age, religious affiliation, grade, experienced hunger in the past 30 days, and student staying with parents during school term were significantly associated with comprehensive HIV/AIDS knowledge. Female respondents were 1.47 times more likely to have comprehensive knowledge of HIV/AIDS than males. In terms of religious affiliation, students who identified as Christian were 2.18 times higher odds of comprehensive HIV/AIDS knowledge

compared to non-Christians. Adolescents who had experienced hunger in the past 30 days were less likely to have comprehensive HIV/AIDS knowledge compared to those who did not experience hunger. Adolescents staying with parents during school term were associated with 1.23 times higher odds of comprehensive knowledge than their counterparts.

The likelihood of possessing comprehensive knowledge was 2.86, 7.28 and 5.90 times higher for students in Forms 3, 4, and 5, respectively, as compared to those in Form 1. Students who had never tested for HIV were 1.18 times more likely to have comprehensive HIV/AIDS knowledge compared to those who had tested for HIV at least once. Older adolescents (15-19 years) were less likely to have HIV/AIDS comprehensive knowledge. Finally, students from private schools had 1.39 times higher odds of comprehensive HIV/AIDS knowledge compared to those from public schools.

Table 5 Multi-level analysis of comprehensive HIV/AIDS knowledge among students (n = 6,676)

Variable	Model II AOR (95% CI)	Model III AOR (95% CI)
Sex		
Male	1.00	1.00
Female	1.55 (1.38, 1.73)***	1.47 (1.31, 1.65)***
Age (years)		
13-14 years old	1.00	1.00
15-19 years old	0.91 (0.81, 1.03)	0.54 (0.47, 0.63)***
Religious Affiliation		
Other (Badimo, no religion, Islam, traditional)	1.00	1.00
Christianity	2.16 (1.84, 2.55)***	2.18 (1.85, 2.57)***
Hunger in the past 30 days		

Never	1.00	1.00
Yes	0.80 (0.73, 1.33)***	0.81 (0.73, 0.91)***
Lives with parent during school term		
No	1.00	1.00
Yes	1.19 (1.05, 1.33)**	1.23 (1.09, 1.38)***
Ever tested for HIV		
Yes	1.00	1.00
No	1.20 (1.07, 1.34)**	1.18 (1.06, 1.33)**
Grade		
Form 1		1.00
Form 2		1.60 (1.36, 1.87)***
Form 3		2.86 (2.36, 3.46)***
Form 4		7.18 (5.33, 9.67)***
Form 5		5.90 (4.31, 8.07)***
School type		
Public		1.00
Private		1.39 (0.89, 2.18)

***p-value < 0.001, **p-value < 0.01, *p-value<0.05, 95% confidence interval in parentheses. *Model I - no covariates controlled for; Model II – controlling for individual variables only and Model III – controlling for individual-level variables and contextual-school factors.*

Discussion

The purpose of this study was to determine the level of comprehensive HIV/AIDS knowledge among Botswana's school-age children and the associated sociodemographic determinants. The overall prevalence of comprehensive HIV/AIDS knowledge was estimated at 58.6% (95% CI: 57.4% - 59. 7%).This suggests that misconceptions about HIV are still persistent among adolescents and may lead to various forms of risky sexual behaviour. Contrary to the findings of this study, the level of comprehensive knowledge in a study on college students in Botswana was higher (Faimau et al., 2016). This discrepancy in outcomes may be attributed to the disparate study populations, as the present study was carried out among secondary school students while the aforementioned study was conducted with university students. Although the rate of comprehensive HIV/AIDS knowledge found in this study is higher than the study findings from Brazil (Lima et al., 2020), Iraq (Othman, 2015), Bangladesh (Huda & Amanullah, 2013) and Nigeria (Enatama & Akpobasa, 2020), there is still need for further progress in this area.

The results of this study show several factors at both the individual and school-contextual levels that have statistically significant associations with comprehensive HIV/AIDS knowledge. Female students were more likely to have higher odds of comprehensive knowledge of HIV/AIDS than their male counterparts. This is consistent with findings from Pakistan (Rehan et al., 2016) and Malaysia (Folasayo et al., 2017). However, this contradicts a study conducted in Erbil City in Iraq (Othman, 2015) and Brazil (Lima et al., 2020) which reported that male students were more likely to have higher rates of comprehensive HIV/AIDS knowledge than their female counterparts. The gender differences in these latter studies may be attributed to gender inequalities and traditional norms concerning issues of sexual health and sexuality which account for the limited comprehensive HIV knowledge among both young men and women. It is worth mentioning that both females and males are at risk of acquiring and transmitting HIV/AIDS. Thus, educational efforts should be targeted at those who are misinformed irrespective of their gender.

Adolescents who cited that they had tested for HIV at least once in their lives had a lower rate of comprehensive knowledge of HIV/AIDS compared to those who had never tested for HIV. This finding is not contrary to what was found in Nigeria (Oginni, Adebajo & Ahonsi, 2017). This result was not expected as it is generally assumed that pre-test information and post-test counselling are essential components of key principles of HIV testing and counselling and should always be

implemented. Consequently, one would assume that HIV testing would offer adolescents an opportunity to receive information about HIV/AIDS prevention methods and enable them to avoid misconceptions previously held. Therefore, although this variable is an important covariate due to the aforementioned information and counselling associated with tests, it may suffer from reverse causality given that better knowledge can result in testing for HIV.

Interestingly, this study found that comprehensive knowledge about HIV/AIDS significantly decreased with age. This finding is inconsistent with studies conducted in Iraq (Othman, 2015) and Malaysia (Folasayo et al., 2017). This was not expected due to the fact one would expect that older adolescents are more experienced in life and have been more exposed to basic information regarding HIV/AIDS as compared to younger adolescents. This contradictory finding might be explained by the fact that there was a programme named Window of Hope of Life Skills introduced in primary and junior secondary schools, which aimed at equipping students with comprehensive knowledge about HIV/AIDS. These are schools with younger adolescents aged 13 to 14 years. Moreover, in 2013, comprehensive sexual education programme implemented by Youth Impact (formerly known as Young 10ve) was introduced in schools and the programme was not widely acceptable in senior secondary schools (Angrist et al., 2019). The latter might explain why adolescents aged 13-14 years had higher comprehensive HIV/AIDS knowledge than adolescents aged 15-19 years.

The study findings are also consistent with a study that reported that religion was significantly associated with comprehensive HIV/AIDS knowledge (Folasayo et al., 2017). We found that Christians had higher odds of comprehensive HIV knowledge compared to non-Christians, and this is consistent with a study that was conducted in Malaysia (Folasayo et al., 2017). The comprehensive knowledge amongst Christian adolescents might be explained by the Botswana Christian AIDS Intervention Programme which is funded by the United States Agency for International Development (USAID) and plays a key role in the fight against HIV/AIDS in partnership with local churches (Morrin, 2013). Therefore, comprehensive awareness of HIV/AIDS within the Botswana community would benefit from the increased involvement of religious leaders of all faiths as well as teamwork and partnerships.

The empirical literature has affirmed that a person's educational level plays a key role in determining their social status, access to information, and income (Gutin et al., 2021). In this study,

students in grade 9 and higher had higher odds of having comprehensive knowledge about HIV/AIDS compared to those in grade 8. This finding is consistent with studies done in Ethiopia (Debalkie, Fentahun & Fetene, 2019; Oljira, Berhane & Worku, 2013) Uganda (Estifanos et al., 2021), and Ghana (Fenny, Crentsil & Asuman, 2017). This stresses the importance of continuing to advocate for and invest in school-based HIV/AIDS interventions.

The results of this study revealed that students who attended private school and those who never experienced hunger in the past 30 days had relatively higher odds of comprehensive knowledge of HIV/AIDS. Attending private schools and never experiencing hunger can be proxies for household wealth or household income. This is because in Botswana public secondary education is free, however, private schools require tuition fees, which could be a barrier to entry for households with low income. Students from private schools have higher odds of comprehensive HIV/AIDS knowledge which can be attributed to private schools having better facilities, smaller class sizes, and more resources than public schools. Additionally, students in private schools are more likely to have a higher degree of exposure to mass media including television, newspapers, and the internet. Thus, families with higher socio-economic status may choose private schools to provide their children with what they perceive as a higher quality education. This finding is consistent with a study done in Iraq (Othman, 2015).

This study has both strengths and limitations. The main strength of this study was the use of multilevel modelling techniques which helped to estimate the fixed effects of both the individual- and contextual-level factors and ascertain the presence of intra-cluster correlations in the observations. This study used a large-scale nationally representative survey which makes the estimates relevant for the entire country compared to more localised studies. In terms of limitations, the use of secondary data limits the variables considered for analysis. For instance, wealth status (Oljira, Berhane & Worku, 2013), place of residence (Faimau et al., 2016) and media exposure (Oljira, Berhane & Worku, 2013) have been linked with comprehensive HIV/AIDS knowledge, and these variables were not available in the dataset. However, as highlighted earlier appropriate proxies were used for wealth. Moreover, since the BYRBBSS data did not have regional-level factors (e.g., regional expenditure on schools), the study did not include them in the analysis. Additionally, the data used for the study is dated as the study was conducted in 2015. In nearly a decade, young children's socioeconomic status and health behaviors may have changed

over time. However, due to data limitations, this dataset remains the best available source for understanding the factors that influence school children's knowledge levels. Despite these limitations, our findings contribute significantly to existing knowledge and serve as a valuable tool for policymakers involved in the implementation of HIV prevention intervention programmes.

Conclusion

In summary, this study shows that comprehensive knowledge plays a major role in the fight against HIV/AIDS. Despite the progress made by the government, our findings indicate a gap in comprehensive knowledge about HIV/AIDS among adolescents attending secondary schools in Botswana. This gap creates the possibility of misconceptions that can ultimately lead to risky behaviours and make young people more vulnerable to HIV infection.

Our study identified several factors that influence comprehensive knowledge about HIV/AIDS. Gender differences were evident, with boys having relatively lower odds of having comprehensive HIV/AIDS knowledge than girls. However, both groups have nontrivial levels of lack of knowledge, necessitating inclusive educational efforts targeted at both genders. Surprisingly, adolescents who underwent at least one HIV testing had lower comprehensive knowledge, suggesting a need for improved information dissemination during the testing process. Age-related differences were unexpected as older adolescents demonstrated lower comprehensive knowledge. The introduction of specific programmes for younger age groups could explain this phenomenon and highlight the importance of continued tailored educational initiatives. Religious affiliation, level of education, type of school and household wealth also played important roles in shaping HIV/AIDS knowledge. This highlights the need for collaborative efforts involving religious leaders, educational institutions, and community-based organisations to broadly raise awareness.

The inclusion of both individual and school-related variables revealed significant school- and regional-level differences that extended beyond what could be attributed to individual and observed school-related characteristics. The presence of significant random effects at the school and regional levels highlights the influence of contextual factors beyond individual characteristics and school-level factors. Understanding these random effects is critical to tailoring interventions that address not only individual knowledge gaps but also systemic factors that contribute to

disparities in comprehensive HIV/AIDS awareness. Policymakers should consider the importance of these contextual effects when developing targeted and effective strategies to improve HIV/AIDS knowledge among adolescents.

Future efforts should focus on bridging knowledge gaps, particularly among vulnerable groups. Tailored educational programmes involving diverse stakeholders are critical to reducing inequalities and promoting comprehensive awareness. This study serves as a critical resource for guiding evidence-based policies and interventions in the ongoing fight against HIV/AIDS in Botswana and beyond.

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Competing interests

The author declares that she has no financial or personal relationships that may have inappropriately influenced her in writing this article.

Author contributions

The author was solely responsible for developing and conceptualising the research topic, conducting a literature review, data analysis and writing of the manuscript.

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Data availability

The data for this study is available upon special request from Statistics Botswana (https://www.statsbots.org.bw/) and the Ministry of Basic Education (https://www.gov.bw/ministries/ministry-basic-education).

Disclaimer

The views and opinions expressed in this manuscript are those of the author and do not reflect the official position of the Government of Botswana.

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PART D: POLICY BRIEF

ANALYSING THE SOCIO-DEMOGRAPHIC DETERMINANTS OF COMPREHENSIVE HIV/AIDS KNOWLEDGE AMONG SCHOOL-GOING CHILDREN IN BOTSWANA

"The greatest barrier to progress in the fight against HIV/AIDS is not scientific or medical, it is stigma, the fear and judgment that too often accompanies ignorance and misunderstanding."

President Barak Obama

Key Points

- *Overall comprehensive HIV AIDS knowledge in Botswana stands at 59%.*
- *Christian students, students from private schools, females and those living with parents during school holidays have more comprehensive knowledge on HIV/AIDS.*
- *Students who once experienced hunger were less likely to have comprehensive HIV/AIDS knowledge.*

Introduction

Comprehensive knowledge of HIV/AIDS is important for young people as studies have shown that they are at risk of contracting HIV due to risky sexual behaviour, lack of knowledge, and limited access to health services (NACA, 2019; UNAIDS, 2019; UNICEF, 2021). Studies show that students with appropriate knowledge engage in less risky sexual behaviour and use prevention methods such as condoms and regular testing (Nubed & Akoachere, 2016; UNICEF, 2021). Since the first HIV case, the Government of Botswana and non-governmental organisations have implemented various strategies to educate people about HIV/AIDS, including HIV testing, counselling, information distribution, and public health campaigns. In addition teacher training manuals, peer education programmes and awareness workshops have been developed (NACA, 2019). Modalities of HIV message dissemination have also evolved over time and adapted to scientific knowledge, societal attitudes, and communication technologies (Chandran, 2016; Slutkin et al., 2006). This policy brief is based on a study which investigated sociodemographic determinants of comprehensive HIV/AIDS knowledge among school children in Botswana.

Background

The fifth Botswana AIDS Impact Survey (BAIS V) conducted in 2021 suggests that Botswana is exceeding the UNAIDS 90-90-90 targets and standing at 95-98-98 (Statistics Botswana, 2022). Although progress has been made, certain challenges remain that still threaten Botswana's goal of bringing the epidemic under control. These include the presence of stigma in the community, which leads to lower testing rates, lower treatment enrolment, and difficulty disclosing status, which can lead to an increase in infections (UNAIDS, 2022). BAIS V and UNAIDS 2021 estimates suggest that although new infections are declining, most cases are among adolescents and young people of ages 15 to 24 years. A 2008 study of young people in Botswana found that 43% of young people did not have comprehensive knowledge of HIV/AIDS, while the data from the current study, found that young people had comprehensive knowledge of 59%. This suggests that young people's comprehensive knowledge of HIV/AIDS has increased by only 16%. This is very concerning as young people account for approximately a quarter of all new HIV infections and raises questions about why young people are being left behind in the national response (UNAIDS-Botswana, 2023).

This means that there may be gaps in interventions, including young people's knowledge about HIV prevention, the availability of services and whether they have misconceptions about HIV/AIDS. Given the limited number of studies conducted on young people and knowledge in Botswana, the aim of the study was to examine the level of comprehensive HIV/AIDS knowledge among school-age children in Botswana. In addition, the factors that contribute to this cohort's comprehensive knowledge of HIV/AIDS were also investigated.

How the Study was Conducted?

Quantitative analysis was conducted using secondary data from the 2015 Botswana Youth Risk Behavioural and Biological Surveillance Survey II. Data was collected from 7,564 students from 135 private and public schools. The final sample size consisted of 6676 students nested in 112 private and public schools. Comprehensive HIV/AIDS knowledge was defined as getting correct answers to all five questions about the disease. This means being able to identify the right HIV prevention methods and reject the myths associated with HIV. The study also investigated the various determinants of an individual's comprehensive HIV/AIDS knowledge. Predictors

examined in our research included gender, age, grade, district, religion, as well as whether students had experienced hunger in the past 30 days, attended private school (both, indicators of economic status) and whether they lived with their parents.

Findings from the Study

- ✓ 59% of study participants had comprehensive HIV/AIDS knowledge.
- ✓ Compared to males, females are more likely to have more HIV/AIDS comprehensive knowledge. *According to literature, the gender difference is attributed to cultural beliefs, socialisation and access to information.*
- ✓ Students who were affiliated with Christianity had comprehensive HIV/AIDS knowledge compared to those with other religions or no religious affiliation.
- ✓ Even though students 13-14 years had comprehensive HIV/AIDS knowledge compared to adolescents aged 15-19 years, the results also state those grade 9, 10, 11 and 12, as had comprehensive HIV/AIDS knowledge compared to those who were in grade 8.
- ✓ Students from private schools had higher odds of comprehensive HIV/AIDS knowledge compared to those from public schools.
- ✓ Adolescents who had experienced hunger in the past 30 days were less likely to have comprehensive HIV/AIDS knowledge compared to those who had not experienced hunger due to lack of food.
- ✓ Adolescents staying with parents during the school term were associated with 1.23 times of comprehensive knowledge compared to their counterparts.

Conclusion

In addressing the growing challenge of new infections among young people, Botswana requires immediate attention to identify drivers of the increase in HIV infections in this cohort. Regardless of commendable past efforts, a notable gap exists in interventions for young people. To effectively curb this trend, there is a need to deliberately prioritise comprehensive awareness and education

initiatives targeting young people. Policymakers should ensure equal access to information in order to empower youth to make responsible decisions when it comes to sexual reproductive health.

Policy Recommendations

The Botswana National Strategic Framework III emphasises the need for tailored interventions, particularly for young people, to contain the spread of HIV/AIDS (Government of Botswana, 2019). This includes promoting comprehensive HIV/AIDS knowledge through the following policy recommendations:

1. **Developing a communication strategy for HIV/AIDS prevention for adolescents and young people:** A comprehensive communication strategy for HIV/AIDS prevention among adolescents and young people, focusing on reducing new infections among the cohort whilst addressing knowledge gaps and inequalities between public and private school students is essential. The strategy should outline guidelines for inclusive curriculum development, teacher training and how health promotion campaigns for young people should be carried out. Additionally, there should be fact-checking and feedback mechanisms for emerging trends to guarantee the strategy's ongoing effectiveness in fostering informed and responsible decision-making regarding HIV/AIDS prevention.
2. **Inclusion of older students in the new HIV/AIDS support programs**: Our findings show that older students are less likely to have comprehensive knowledge compared to younger students. To close the observed knowledge gap between older and younger students, programs currently offered to younger students should be expanded to include older students.
3. Author details: This study was conducted by Shatho Joy Kgosi and funded by the Government of Botswana. For further information: shatho826@gmail.com

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PART E: APPENDICES

APPENDIX 1: Plagiarism Declaration

1. I know that plagiarism is wrong. Plagiarism is to use another's work and pretend that it is one's own.
2. I have used the APA 7th edition for citation in the protocol, literature review and Vancouver style in the journal manuscript and policy brief. Each contribution to and quotation in this dissertation from the work(s) of other people has been attributed, has been cited and referenced.
3. This mini dissertation is my own work. I have not allowed and will not allow anyone to copy my work with the intention of passing it off as his/her own work.

Name: Shatho Joy Kgosi

Signature: Signed by candidate

Date: 10 February 2024

APPENDIX 2: ETHICS FORMS

UNIVERSITY OF CAPE TOWN

FACULTY OF HEALTH SCIENCES
Human Research Ethics Committee

FHS016: Annual Progress Report / Renewal

HREC office use only (FWA00001637; IRB00001938) This serves as notification of annual approval, including any documentation described below.			
☑ Approved	Annual progress report	Approved until/next renewal date	30/11/24
☐ Not approved	See attached comments		
Signature Chairperson of the HREC/ Designee	Signed by candidate	Date Signed	13/11/2023

Note: Please email this form and supporting documents (if applicable) in a combined pdf-file to hrec-enquiries@uct.ac.za.
Please clarify your plan for research-related activities during COVID-19 lockdown.
Please use the latest form found on our website:
http://www.health.uct.ac.za/fhs/research/humanethics/forms

Comments to PI from the HREC

Principal Investigator to complete the following:

1. Protocol information

Date (when submitting this form)	11 November 2023		
HREC REF Number	758\2022	Current Ethics Approval was granted until	30/11/2023
Protocol title	Analysing District Disparities In Comprehensive HIV/AIDS Knowledge Among School-Going Children Aged 13-19 Years In Botswana: A Multi-Level Analysis.		
Protocol number (if applicable)			
Are there any sub-studies linked to this study?	☐ Yes	✓No	
If yes, could you please provide the HREC Reference number for all sub-studies? **Note:** A separate FHS016 must be submitted for each sub-study.			
Principal Investigator	Dr Amarech Obse		
Department / Office Internal Mail Address	ag.obse@uct.ac.za		
1.1 Does this protocol receive US Federal funding?	☐ Yes	✓ No	

HUMAN RESEARCH ETHICS COMMITTEE
13 NOV 2023
HEALTH SCIENCES FACULTY
UNIVERSITY OF CAPE TOWN

(Note: Please complete the Closure form (FHS010) if the study is completed within the approval period)

1.2 If the study receives US Federal Funding, does the annual report require full committee approval? **Note:** Any annual approvals for **Full Committee** review MUST be submitted on the monthly HREC submission dates. (Please send electronic copy for full committee review to hrec-submission@uct.ac.za)	☐ Yes	✓ No

If yes in 1.2 please complete section 1.3 below for invoicing purposes

1.3 Ethics Renewal Fee

Please **(tick ✓)**appropriate box for billing purposes:

Submission Type	***Description***	***New fee (Vat Incl.)***	***tick ✓***
Research funded solely from UCT departmental/ divisional/group budget	Annual evaluation of research progress report for re-certification	**R0,00**	☐
Non-sponsored student research for degree purposes at UCT/Other Universities & Colleges	Annual evaluation of research progress report for re-certification	**R0,00**	✓
Annual re-certification / Progress report (FHS016 Form)	Clinical Trial & International Grant Funded Research - Annual evaluation of research progress report for re-certification for Full Committee Approval	**R7000,00**	☐
Annual re-certification / Progress report (FHS016 Form)	Clinical Trial & International Grant Funded Research - Annual evaluation of research progress report for re-certification for Expedited review	**R3 710.00**	☐
Annual re-certification / Progress report (FHS016 Form)	National grant funded research - Annual evaluation of research progress report for re-certification for Full Committee Approval	**R6000.00**	☐
Annual re-certification / Progress report (FHS016 Form)	National Grant funded research for Annual evaluation of research progress report for re-certification for Expedited review	**R1 500,00**	☐

NB: Protocols funded by UCT (e.g. departmental funding / student research) and by certain grant funding organizations (e.g. MRC, NRF, CANSA,) are exempt from these charges.

Please provide details for Invoicing, either complete section 1 or 2 :

1. Invoice billing – Directly to Sponsor

Sponsor's name	Government of Botswana – National AIDS & Health Promotion Agency
Billing Address of Sponsor:	P/Bag 00463, Gaborone
Vat Number:	
Contact person	Motlatsi Mogotsi
Telephone number	+267 365 4806
Email Address	mtlmogotsi@gov.bw

2. **Internal Journal Billing:**	
Fund Number:	
Cost Centre Number:	
Account Holder Name:	
Division of Account Holder:	

2. List of documentation for approval

Protocol

3. Protocol status (tick ✓)

☐	Open Enrolment
☐	Closed to enrolment (tick ✓)
☐	Research-related activities are ongoing
☐	Research-related activities are complete, long-term follow-up only
✓	Research-related activities are complete, data analysis only
☐	Main study is complete but sub-study research-related activities are ongoing
☐	Study is closed → Please submit a Study Closure Form (FHS010)

4. Enrolment

Number of participants enrolled to date	-
Number of participants enrolled, since last HREC Progress report (continuing review)	-
Additional number of participants still required	-

5. Refusals

Total number of refusals (participants invited to join the study, but refused to take part)	-

6. Cumulative summary of participants

Total number of participants who provided consent	-
Number of participants determined to be ineligible (i.e. after screening)	-

(Note: Please complete the Closure form (FHS010) if the study is completed within the approval period)

Number of participants currently active on the study	-
Number of participants completed study (without events leading to withdrawal)	-
Number of participants withdrawn at participants' request (i.e. changed their mind)	-
Number of participants withdrawn by PI due to toxicity or adverse events	-
Number of participants withdrawn by PI for other reasons (e.g. pregnancy, poor compliance)	-
Number of participants lost to follow-up. Please comment below on reasons for loss of follow-up.	-
-	
Number of participants no longer taking part for reasons not listed above. Please provide reasons below:	-

7. Progress of study

Please provide a brief summary of the research to date including the overall progress and the progress since the last annual report as well as any relevant comments/issues you would like to report to the HREC:
Protocol was approved last year December. Since its approval, all chapters (literature review, journal manuscript and policy brief) for the dissertation have been developed. Engagements are currently ongoing on finalising the chapters for submission.

8. Protocol violations and exceptions (tick ✓ all that apply)

✓	No prior violations or exceptions have occurred since the original approval
☐	Prior violations or exceptions have been reported since the last review and have already been acknowledged or approved
☐	Unreported minor violations that have occurred since the last review, as well as significant deviations not yet reported, are attached for review

9. Amendments (tick ✓ all that apply)

☐	No Prior amendments have been made since the original approval
☐	Prior amendments have been reported since the last review and have already been approved
✓	New protocol changes/ amendments are requested as part of this continuing review (See note below)

(Note: Please complete the Closure form (FHS010) if the study is completed within the approval period)

Note: If new protocol changes are being requested in this review, please complete an amendment form (FHS006).
Specific changes in the amended protocol and consent/assent forms must be **bolded**, *italicised* or tracked and all changes must include a rationale.

10. Adverse events

10.1 Please provide below or attach a narrative summary of serious adverse events and/ or unanticipated problems since the last progress report. Please indicate changes made to the protocol and informed consent document(s) as a result (if not already reported to the HREC). Please comment on whether causality to any study procedure or intervention could be established.
-

10.2 Have participants received appropriate treatment/ follow-up/ referral when indicated (e.g. in the case of abnormal or incidental clinical findings, distress or anxiety)?		
☐ Yes	☐ No	✓ Not applicable
If yes, please describe:		
-		

11. Summary of Monitoring and Audit Activities (tick ✓)

11.1 Was this study monitored or audited by an external agency (e.g. SAHPRA, FDA)?		
☐ Yes	☐ No	✓ Not applicable

11.2 Did a Data and Safety Monitoring Board publish a report?		
☐ Yes	☐ No	✓ Not applicable

11.3 If yes, please identify the agency and attach a summary of the findings.					
Agency Name		Report attached	☐ Yes	☐ No	✓ Not applicable
		DSMB report attached	☐ Yes	☐ No	✓ Not applicable

11.4 Has there been any agency, institutional or other inquiry into non-compliance in this study, or any finding of non-compliance concerning a member of the research team?	
☐ Yes	✓ No
If yes, please explain:	

12. Level of risk (tick ✓)

12.1 In light of your experience of this research, please indicate whether the level of risk to participants has:	
☐	Increased
☐	Decreased

(Note: Please complete the Closure form (FHS010) if the study is completed within the approval period)

✓	Shown no change
If there has been a change, please explain:	
-	

12.2 Please provide a narrative summary of recent relevant literature that may have a bearing on the level of risk.
-

13. Insurance

Please confirm that valid no fault insurance is still in place? **(tick ✓)**			
☐ Yes	☐ No	✓ Not Applicable – N/A	
If yes, please complete the following:			
Insurer's name:			
Policy no.		*Coverage Period:	
For UCT sponsored studies please liaise the insurance office via fhs.sponsorship@uct.ac.za regarding the required documentation and information required obtain a renewed UCT No-fault Insurance Certificate.			

14. Statement of conflict of interest

Has there been any change in the conflict of interest status of this protocol since the original approval? (tick ✓)	
☐ Yes	✓ No
If yes, please explain and if necessary, attach a revised conflict of interest statement (Section #7 in the New Protocol Application Form FHS013):	

15. Signature

My signature certifies that the above is complete and correct.			
Signature of PI	Signed by candidate	Date	6.11.2023

(Note: Please complete the Closure form (FHS010) if the study is completed within the approval period)

1. ETHICS APPROVAL

UNIVERSITY OF CAPE TOWN
Faculty of Health Sciences
Human Research Ethics Committee

Room 45 E-52-E-Floor- Old Main Building
Groote Schuur Hospital
Observatory 7925
Telephone [021] 406 6492
Email: hrec-submissions@uct.ac.za
Website: https://health.uct.ac.za/home/human-research-ethics

22 November 2022

HREC REF: 758/2022

Dr A Obse
Health Economics Division
FHS
Email: ag.obse@uct.ac.za
Student: GMMSHA001@myuct.ac.za

Dear Dr Obse

PROJECT TITLE: ANALYSING DISTRICT DISPARITIES IN COMPREHENSIVE HIV/AIDS KNOWLEDGE AMONG SCHOOL-GOING CHILDREN AGED 13-19 YEARS IN BOTSWANA: A MULTILEVEL ANALYSIS.-
(MASTERS CANDDIATE-MRS SHATHO KGOSI)

Thank you for submitting your study to the Faculty of Health Sciences Human Research Ethics Committee (HREC) for review.

It is a pleasure to inform you that the HREC has **formally approved** the above-mentioned study.

Approval is granted for one year until the 30 November 2023.

Please submit a progress form, using the standardised Annual Report Form if the study continues beyond the approval period. Please submit a Standard Closure form if the study is completed within the approval period.
(Forms can be found on our website: www.health.uct.ac.za/fhs/research/humanethics/forms)

The HREC acknowledge that the student: Mrs Shatho Kgosi will also be involved in this study.

Please quote the HREC REF 758/2022 in all your correspondence.

Please note that the ongoing ethical conduct of the study remains the responsibility of the principal investigator.

Please note that for all studies approved by the HREC, the principal investigator **must** obtain appropriate institutional approval, where necessary, before the research may occur.

Yours sincerely Signed by candidate

PROFESSOR M BLOCKMAN
CHAIRPERSON, FACULTY OF HEALTH SCIENCES HUMAN RESEARCH ETHICS COMMITTEE

Federal Wide Assurance Number: FWA00001637. Institutional Review Board (IRB) number: IRB00001938 NHREC-registration number: REC-210208-007
This serves to confirm that the University of Cape Town Human Research Ethics Committee complies to the Ethics Standards for Clinical Research with a new drug in patients, based on the Medical Research Council (MRC-SA), Food and Drug Administration (FDA-USA), International Council for Harmonisation of Technical Requirements for Pharmaceuticals for Human Use: Good Clinical Practice (ICH GCP), South African Good Clinical Practice Guidelines (DoH 2020), based on the Association of the British Pharmaceutical Industry Guidelines (ABPI), and Declaration of Helsinki (2013) guidelines. The Human Research Ethics Committee granting this approval is in compliance with the ICH Harmonised Tripartite Guidelines E6: Note for Guidance on Good Clinical Practice (CPMP/ICH/135/95) and FDA Code Federal Regulation Part 50, 56 and 312.

2. PROTOCOL AMENDMENT FORMS

UNIVERSITY OF CAPE TOWN

FACULTY OF HEALTH SCIENCES
Human Research Ethics Committee

Form FHS006: Protocol Amendment

HREC office use only (FWA00001637; IRB00001938)		
☑ Approved	☑ Type of review: Expedited	☐ Full committee
This serves as notification that all changes and documentation described below are approved.		
Signature HREC Chairperson / Designee: Signed by candidate	Date: 24/11/2023	

Note: All **Major** amendments must include a **Cover Letter** and a local **PI Synopsis** justifying the changes for the amendment. Please note that incomplete amendment submissions will not be reviewed.

Please email this form and supporting documents (if applicable) in a combined pdf-file to hrec-enquiries@uct.ac.za with subject line: FHS006 + (HREC Reference number).

The latest forms are found on our website.

http://www.health.uct.ac.za/fhs/research/humanethics/forms

Please also clarify your plan for research-related activities during COVID-19 lockdown.

Comments from the HREC to the Principal Investigator:
Note: The approval of this protocol amendment does not grant annual approval. Please complete the FHS016 / FHS017 form for annual approval at least one month before study expiration.

Principal Investigator to complete the following:

1. Protocol information

Date (when submitting this form)	6 November 2023		
HREC REF Number	758/2022		
Protocol Title	Analyzing district disparities in comprehensive HIV/AIDS knowledge among school going children aged 13-19 years in Botswana: A multi-level Analysis		
Protocol Number (if applicable)			
Principal Investigator	Amarech Obse		
Department / Office Internal Mail Address	9 October 2023		
1.1 Is this a major or a minor amendment? (see FHS006hlp) Major (tick box) Minor (tick box)		☐ Major	✓ Minor
1.2 Does this protocol receive US Federal funding?		☐ Yes	✓ No

HUMAN RESEARCH ETHICS COMMITTEE
13 NOV 2023
HEALTH SCIENCES FACULTY
UNIVERSITY OF CAPE TOWN

1.3 If the amendment is a major amendment and receives US Federal Funding, does the amendment require full committee approval? **Note:** Any protocol amendments for **Full Committee Review** MUST be submitted on the monthly HREC submission dates. (Please email an electronic copy to hrec-enquiries@uct.ac.za)	☐ Yes	✓ No
1.4 Did the initial study require UCT No-Fault Insurance	☐ Yes	✓ No

2. List of Proposed Amendments with Revised Version Numbers and Dates

Please itemise on the page below, all amendments with revised version numbers and dates, which need approval. This page will be detached, signed and returned to the PI as notification of approval. Please add extra pages if necessary.
Title Rewording - Cover Page_ Version 2 – 6.11.23 Revision of study Objectives- pages 25-26_Version 2 – 6.11.23 Revision of Conceptual Frameworks – pages 26 – 32_ Version 2 – 6.11.23 Revision of methods of data analysis – pages 32-33_Version 2 – 6.11.23

3. Protocol status (tick ✓)

☐	Open to enrolment
☐	No participants have been enrolled
	Closed to enrolment (tick ✓)
☐	Research-related activities are ongoing
☐	Research-related activities are complete, long-term follow-up only
✓	Research-related activities are complete, data analysis only

4. Proposed changes will affect: (tick ✓ all the categories that apply)

Protocol	
☐	Study objectives, design (including investigator's brochure, clinical activities, study length)
☐	Study instruments, questionnaires, interview schedules
☐	Sample size
☐	Recruitment methods
☐	Eligibility criteria (inclusion and exclusion criteria)

☐	Drug/device (composition, amount, schedule, route of administration, combination with other drugs/devices, safety information)
✓	Data collection/ analysis
☐	Principal Investigator. (Please attach revised conflict of interest and PI declaration statements. Refer: sections 7 and 8.4 in the New Protocol Application Form FHS013)
☐	Consent form and information sheet
☐	Recruitment materials (e.g. advertisements)
☐	Administrative (e.g. change in sponsor's name, change in contact information)
☐	Other. Please specify:

**Note: Amendment changes involving study length, sample size, additional sites and eligibility criteria (i.e. inclusion of minors and /or pregnant woman) need to be declared to the Insurance office. Please liaise via fhs.sponsorship@uct.ac.za regarding the required documentation and information to be submitted to obtain an updated UCT No-fault Insurance Certificate- it should be included herewith*

4.1 In your opinion, will there be any **increase** in risk, discomfort or inconvenience to participants?	☐ Yes	☐ No
If yes, please provide a detailed justification/explanation:		

4.2 What follow-up action do you propose for participants who are already enrolled in the study?	
☐	Inform current participants as soon as possible
☐	Re-consent current participants with revised consent/assent forms (append)
✓	No action required
☐	Other. Please describe:

5. Detailed description of the change(s)

Please attach, for each amendment, a summary of all changes which clearly indicates:

i. Old wording (e.g. ~~strikethrough~~ text, CHANGED FROM and CHANGED TO)

ii. New wording (e.g. *italicized*, **bold**, tracked)

iii. Detailed rationale/ justification/ explanation for each change

6. Ethics Review for Amendment Levy – cost including vat

Amendment Review Costs including VAT

Please tick amount to be billed:

Submission Type	*Description*	*New fee (Vat Incl.)*	*tick ✓*
Research funded solely from UCT departmental/ divisional/group budget	Major/ Minor Amendments	**R0,00**	☐
Non-sponsored student research for degree purposes at UCT/Other Universities & Colleges	Major/ Minor Amendments	**R0,00**	✓
Protocol amendment - Major (FHS006 Form)	Clinical Trial & International Grant Funded Research - Any changes to the protocol that requires Full Committee review	**R8 000.00**	☐
Protocol amendment - Major (FHS006 Form)	Clinical Trial & International Grant Funded Research - Any change to the protocol that requires Expedited review that does not require Full Committee Review	**R5 000,00**	☐
Protocol amendment - Minor (FHS006 Form)	Clinical Trial & International Grant Funded Research - Minor amendments, administrative changes that do not affect study design e.g. changes to informed consent form, changes in study staff, etc.	**R2 250,00**	☐
Protocol amendment - Major (FHS006 Form)	National grant funded research - Any change to the protocol that requires Full Committee review	**R7 000,00**	☐
Protocol amendment - Major (FHS006 Form)	National grant funded research - Any change to the protocol that requires Expedited review that does not require Full Committee review	**R2 500,00**	☐
Protocol amendment - Minor (FHS006 Form)	National grant funded research - Minor amendments, administrative changes that do not affect study design e.g. changes to informed consent form, changes in study staff, etc.	**R1 000,00**	☐

NB: Protocols funded by UCT (e.g. departmental funding / student research) and by certain grant funding organizations (e.g. MRC, NRF, CANSA,) are exempt from these charges.

Please provide details for Invoicing, either complete section 1 or 2 :

1. Invoice billing – Directly to Sponsor

Sponsor's name	
Billing Address of Sponsor:	
Vat Number:	
Contact person:	
Telephone number:	
Email Address:	

2. Internal Journal Billing:

Fund Number:	

Cost Centre Number:	
Account Holder Name:	
Division of Account Holder:	

7. Amendment Submission checklist (tick ✓)

7.1 Please tick that all the documents are attached before submitting to the HREC. NB: Incomplete submissions will not be processed	
✓	Latest FHS006 form completed with all sections completed as per our website
☐	Cover Letter
☐	PI Justification/ Summary for the reasons for the amendment
✓	Protocol - Track changes & Clean Copy (where necessary)
☐	Informed Consent Forms (ICF), if applicable (Any changes made to ICF tracked & clean copy)
☐	Any other additional documentation in support of amendment
☐	Updated no fault insurance certificate (if applicable)

Please email this form and supporting documents (if applicable) in a combined pdf-file to hrec-enquiries@uct.ac.za with subject line: FHS006 + (HREC Reference number). The latest forms are found on our website.

8. Signature

My signature certifies that I will maintain the anonymity and/ or confidentiality of information collected in this research. If at any time I want to share or re-use the information for purposes other than those disclosed in the original approval, I will seek further approval from the HREC.

Signature of PI	Signed by candidate	Date	6. 11. 2023

APPENDIX 3: STUDY QUESTIONNAIRE

Second Botswana Youth Risk Behavioural and Biological Surveillance

Study questionnaire

2nd BIOLOGICAL AND BEHAVIOURAL SURVEILLANCE SURVEY AMONG SECONDARY SCHOOL STUDENTS IN BOTSWANA, 2015

D	D	M	M	Y	Y

Date of interview:

R	R	-	S	S	-	C	C	-	P	P	P	P

Survey ID

Staff code: .....

Participant's Consent

The Ministry of Education is conducting a survey to get to know about health behavior and HIV prevalence among learners. The results will help provide a framework to implement healthy behavioural interventions and support HIV prevention and care among learners.

This survey consists of filling a questionnaire about health behaviors, risks and testing for HIV. Learners will use confidential handheld computers to answer questions about their opinions and knowledge of sexuality and HIV, nutrition, and alcohol use and provide few drops of blood for HIV testing. You are one of the 9500 persons randomly invited among a total of 164,000 secondary school students in Botswana to participate in the survey.

Please read the full consent Form (Appendix B- Informed assent information sheet for secondary school students.docx)

Question NO	Questions		Skip pattern
Q1	Do you accept to participate in the survey?		
		Yes 1	Go to Section 1, Question 6
		NO 2	Answer Q2-5
Q2	How old are you?		
	12 years old or younger	1	
	13 years old	2	
	14 years old	3	
	15 years old	4	
	16 years old	5	
	17years old	6	
	18 years old	7	
	19 years old or older	8	

Q3 What is your sex?

Male	1
Female	2

Q4 In what form are you?

Form 1	1
Form 2	2
Form 3	3
Form 4	4
Form 5	5

Q4a Please circle all of these items that your family owns or has inside your house.

a.	Television	1
b.	Car	2
c.	Refrigerator	3
d.	Toilet inside the house	4
e.	Electricity inside the house	5
f.	Running water inside the house	6

Q4b What is the highest level of schooling that your parents have?

a.	Primary school	1
b.	Secondary school	2
c.	Some university	3
d.	University degree	4
e.	Graduate degree	5
f.	Do not know	6

Q5 Why do you refuse to participate in the survey?

I do not want to take the time.	1
I am embarrassed to respond.	2
I am uncomfortable using this machine.	3
I am afraid my answers will not be secret.	4
I do not like surveys.	5
I am afraid of HIV testing	6

Thank you for your responses, now hand over the PDAs to the research assistant and leave the room quietly.

Question		Answer/Category	Code	Skip to
Q6	How old are you?			
		12 years old or younger	1	
		13 years old	2	
		14 years old	3	
		15 years old	4	
		16 years old	5	
		17years old	6	
		18 years old	7	
		19 years old or older	8	
Q7	What is your sex?			
		Male	1	
		Female	2	
Q8	In what form are you?			
		Form 1	1	
		Form 2	2	
		Form 3	3	
		Form 4	4	
		Form 5	5	
Q9	How tall are you without your shoes on?			
		Height in centimeters	……Cm	
Q10	How much do you weigh without your shoes on?			
		Weight in kilograms	…Kg	
Q11	Is your biological mother alive?			
		Yes	1	
		No	2	
Q12	Is your biological father alive?			
		Yes	1	
		No	2	
Q13	Are your biological parents married?			
		Yes	1	
		No	2	
Q14	Are your biological parents (father and mother) living in the same house?			
		Yes	1	
		No	2	

Q15 Is this your home village or town?

Yes	1
No	2

Q16 What religion are you?

No religion	0
Christianity	1
Islam	2
Badimo	3
Traditional Church	4

Q17 Who do you usually live with during the school term m ?

Alone	1
With parents	2
With relatives	3
With neighbours	4
With peers/friends/students outside school	5
With fellow students at a boarding school	6

Q18 Who do you usually live with during school holidays?

Alone	1
With Parents	2
With family relatives	3
With neighbours	4
With peers/friends/students	5
With fellow students at a boarding school	6

Section 2: History of alcohol, drugs and tobacco use

The next questions ask about drinking alcohol. This includes drinking beer, wine, wine coolers, and liquor such as rum, gin, vodka, or whiskey. For these questions, drinking alcohol does not include drinking a few sips of wine for religious purposes.

Q19 During your life, on how many days have you had at least one drink of alcohol?

I have never had a drink of alcohol	1	Skip to Q30
1 or 2 days	2	
3 to 9 days	3	
10 to 19 days	4	
20 to 39 days	5	
40 to 99 days	6	
100 or more days	7	

Q20 What was the main reason that you drank alcohol the first time?

To socialize	1
To forget my problems	2
I was angry	3
To relax	4
Peer pressure	5
To experiment	6

Q21 How old were you when you had your first drink of alcohol other than a few sips of wine for religious purposes?

9 years old or younger	1
10 or 11 years old	2
11 or 12 years old	4
13 or 14 years old	5
15 or 16 years old	6
17 years old	7
18 years old or older	8

Q22 During the past 30 days, on how many days did you have at least one drink of alcohol?

I did not have a drink of alcohol in the past 30 days	1	Skip to Q29
1 or 2 days	2	
3 to 9 days	3	
10 to 19 days	4	
20 to 29 days	5	
All 30 days	6	

Q23 During the past 30 days, on how many days did you have 5 or more drinks of alcohol in a row, that is, within a couple of hours?

I did not have 5 or more drinks in a row on any day in the past 30 days.	1
1 day	2
3 to 5 days	3
6 to 9 days	4
10 to 19 days	5
20 or more days	6

Q24 During the past 30 days, how did you usually get the alcohol you drank?

I bought it in a bottle store	1
I bought it at a restaurant, bar or club	2
I gave someone money to buy it for me	3
Someone gave it to me	4
I took it from home	5
I got it some other way	6
I got in a liquor restaurant	7

Q25 During the past 30 days, on how many days did you have at least one drink of alcohol on school property?

0 days	1
1 or 2 days	2
3 to 9 days	3
10 to 19 days	4
20 to 29 days	5
All 30 days	6

Q26 During the past 30 days, in which of the following places did you most frequently have your drink of alcohol?

School property	1
At home	2
At a bar, shebeens, pub or club	3
In a liquor restaurant	4
At someone else's home	5

Q27 During the past 30 days, how many times did you get sick after you drank alcohol?

None	1
1-4 times	2
5-9 times	3
10-19 times	4
20 times or more	5

Q28 During the past 30 days, whom did you drink alcohol with most of the time?

Friends	1
Boyfriend/Girlfriend	2
Parents	3
Relatives	4
Alone	5

Q29 What was the main reason that you drank alcohol the last time you took it? All who have ever drank alcohol to respond

To socialize	1
To forget my problems	2
I was angry	3
To relax	4
Peer pressure	5
To experiment	6

Q30 Have you received any lessons in class on the? negative effects of alcohol drinking? All to respond

Yes	1	
No	2	Skip to Q32

Q31 Have the lessons received in class about alcohol help you decide to STOP drinking alcohol?

Yes	2
No	3

The following questions are about drug us Drugs can refer to marijuana, glue, mandrax, cocaine, ecstasy, snuff, sextasy, and other things used to feel good, relaxed, and get high

Q32 During your life, have you ever used marijuana (Motokwane, dagga, grass, pot)?

Yes	1	
No	2	Skip to Q36

Q33 How old were you when you tried marijuana for the first time?

9 years old or younger	1
10 or 11 years old	2
11 or 12 years old	3
13 or 14 years old	4
15 or 16 years old	5
17 years old	6
18 years old or older	7

Q34 During the past 30 days, how many times did you use marijuana?

0 times	1	Skip to Q36
1 or 2 times	2	
3 to 9 times	3	
10 to 19 times	4	
20 to 39 times	5	
40 or more times	6	

Q35 During the past 30 days, how many times did you use marijuana on school property?

0 times	1
1 or 2 times	2
3 to 9 times	3
10 to 19 times	4
20 to 39 times	5
40 or more times	6

The next series of questions ask about other drugs.

Q36 During your life, which of the following have you ever tried?

		NO	Yes
Q36a	Glue	0	1
Q36b	Mandrax	0	1
Q36c	Cocaine	0	1
Q36d	Ecstasy	0	1
Q36e	Sextasy	0	1

Q37 During the past 30 days, which of the following have you ever tried?

		NO	Yes
Q37a	Glue	0	1
Q37b	Mandrax	0	1
Q37c	Cocaine	0	1
Q37d	Ecstasy	0	1
Q37e	Sextasy	0	1

Q38 During your life, how many times have you used a needle to inject any illegal drug into your body?

0 times	1
1 time	2
2 or more times	3

Q39 During the past 12 months, has anyone offered, sold, or given you an illegal drug on school property?

Yes	1
No	2

The next set of questions ask about tobacco usage

40. Have you ever tried or experimented with cigarette smoking, even one or two puffs?

Yes	1	
No	2	Skip to Q48

41. How old were you when you smoked a cigarette for the first time?

8 years old or younger	1
9 or 10 years old	2
11 or 12 years old	3
13 or 14 years old	4
15 or 16 years old	5
17 years old or older	6

42. During the past 30 days, on how many days did you smoke cigarettes?

0 days	1	Skip to Q47
1 or 2 days	2	
3 to 5 days	3	
6 to 9 days	4	
10 to 19 days	5	
20 to 29 days	6	
All 30 days	7	

43. During the past 30 days, on the days you smoked, how many cigarettes did you smoke per day?

Less than 1 cigarette per day	1
1 cigarette per day	2
2 to 5 cigarettes per day	3
6 to 10 cigarettes per day	4
11 to 20 cigarettes per day	5
More than 20 cigarettes per day	6

44. During the past 30 days, how did you usually get your own cigarettes? (Select only one response)

I bought them in a store such as a convenience store, supermarket, discount store, or gas station	1
I bought them from a vending machine	2
I gave someone else money to buy them for me	3
I borrowed (or bummed) them from someone else	4
A person 18 years old or older gave them to me	5
I took them from a store or family member	6

Q45 During the past 30 days, on how many days did you smoke cigarettes on school property?

0 days	1
1 or 2 days	2
3 to 5 days	3
6 to 9 days	4
10 to 19 days	5
20 to 29 days	6
All 30 days	7

Q46 Have you ever smoked cigarettes daily, that is, at least one cigarette every day for 30 days?

Yes	1
No	2

Q47 During the past 12 months, did you ever try to quit smoking cigarettes?

I did not smoke during the past 12 months	1
Yes	2
No	3

Q48 Have you ever used chewing tobacco or snuff?

Yes	1	
NO	2	Skip Q50

Q49 During the past 30 days, have you used chewing tobacco or snuff on school property?

Yes	1
No	2

Q50 Have you received any lessons in class on the negative effects of smoking? All to respond

Yes	1	
No	2	Skip Q52

Q51 Have the lessons on smoking in school helped you decide not to smoke?

Yes	1
No	2

	Answer/Category	Code	Skip
Q52	Have you ever had sexual intercourse?		
	Yes	1	
	No	2	Skip to Q75

Q53 How old were you when you had sexual intercourse for the first time?

8 years old or younger	1
9 or 10 years old	2
11 or 12 years old	3
13 or 14 years old	4
15 or 16 years old	5
17 years old or older	6

Q54 During your life, with how many people have you had sexual intercourse with?

1 person	1
2 people	2
3 people	3
4 people	4
5 people	5
6 or more people	6

Q55 During the past 3 months, with how many people did you have sexual intercourse with?

I have had sexual intercourse, but not during the past 3 months	1
1 person	2
2 people	3
3 people	4
4 people	5
5 people	6
6 or more people	7

Q56 The last time you had sex; did you drink alcohol or use drugs before having sex?

Yes	1
No	2

Q57 The last time you had sexual intercourse; did you or your partner use a condom?

Yes	1
No	2

Q58 How many years younger or older was that first person you had sexual intercourse with?

0 1	
1 to 4 years	2
5 to 9	3
more than 10 years	4

Q59 The first time you had sex, were you physically forced to have sexual intercourse when you did not want to?

Yes	1
No	2

Q60 When you had sex for that first time, who was it with?

Classmate or friend	1
A family member	2
My boyfriend/Girlfriend	3
A teacher	4
A friend of the family	5

The next series of questions ask about sexual intercourse in the last 12 months.

Q61 Have you had sex in the last 12 months?

Yes	1	
No	2	Skip to Q65

Q62 During the past 12 months, with how many people did you have sex?

Number of sexual partners …….

Q63 During the past 12 months, when you had sex, who was it with?

CHECK ALL THAT APPLY

	Yes	No
Classmate or friend	1	2
Classmate or friend	1	2
A family member	1	2
My boyfriend/Girlfriend	1	2
A teacher	1	2
A friend of the family	1	2

Q64 During the past 12 months, did anybody force you to have sex with them?

Yes	1
No	2

The next series of questions ask about pregnancy and pregnancy prevention.

Q65 Have you ever been pregnant or gotten someone pregnant?

0 times	1
1 time	2
2 or more times	

Q66 The last time you had sexual intercourse, what one method did you or your partner use to prevent pregnancy? (Select only one response)

No method was used to prevent pregnancy	1
Birth control pills	2
Condoms	3
Depo-Provera (or any injectable birth control), Nuva Ring (or any birth control ring), Implantation (or any implant), or any IUD	4
Withdrawal	5
Some other method	6

Q67 Where did you go to get your methods to prevent pregnancy?

CHECK ONLY ONE THAT APPLIES

My friends/peers	1
Health facility and VCT centers	2
Chemists and supermarkets	3
Semsausu/Tuck shop and garage	4
Private place (Toilet…)	5
Night clubs/bars/Bottle stores/Shebeens	6

Q68 Where would you be most comfortable getting a condom?

CHECK ONLY ONE PLACE

My friends/peers	1
Health facility and VCT centers	2
Chemists and supermarkets	3
Semsausu/Tuck shop and garage	4
Private place (Toilet…)	5
Night clubs/bars/Bottle stores/Shebeens	6

Section 4: Transactional sex: The next series of questions ask about sex you have had where gifts, money, drugs were received or given for sex

Q69 Have you ever had sex where money, drugs, or gift were received/ given for sex?

Yes	1	
No	2	Skip to Q75

Q70 The last time you had sex; did you give or receive a gift, money or drugs for sex?

Yes	1
No	2

Q71 The last time you had sex where something was received/ given, did you use a condom?

Yes	1	
No	2	Skip to Q74

Q72 Who suggested using a condom that time?

Me	1
My partner	2
Joint decision	3

Q73 What was the main reason you used a condom that time?

Avoid pregnancy	1	
Avoid STIs	2	
Avoid HIV	3	
		Skip to Q75

Q74 What was the main reason you did not use a condom that time?
SELECT ONLY ONE

Did not have one with me/us at the time	1
Too expensive	2
Partner objected	3
Scared to ask	4
Don't like them	5
Used other contraceptive	6
Didn't think it was necessary	7
By the time I thought of it, it was too late	8
I know I do not have HIV/STIs	9
I was drunk/high	10
I was forced to have sex	11
I trust my partner	12

Section 5: Sexually Transmitted Infections

The next series of questions ask about your knowledge of HIV and sexually transmitted infections.

Q75 Have you ever been taught about STIs and HIV infection in school?

Yes	1
No	2

			Y	N
Q76	Which of the following are symptoms of STIs in women?			
Q76a		Abdominal pain	1	2
Q76b		Genital discharge	1	2
Q76c		Foul smelling discharge	1	2
Q76d	CHECK ALL	Burning pain on urination	1	2
Q76e	THAT APPLY	Genital ulcers/sores	1	2
Q76f		Severe headache		
Q76g		Swellings in groin area	1	2
Q76h		Itching	1	2

			Y	N
Q77	Which of the following are symptoms of STIs in men?			
Q77a		Abdominal pain	1	2
Q77b		Genital discharge	1	2
Q77c		Foul smelling discharge	1	2
Q77d	CHECK ALL	Burning pain on urination	1	2
Q77e	THAT APPLY	Genital ulcers/sores	1	2
Q77f		Severe headache		
Q77g		Swellings in groin area	1	2
Q77h		Itching	1	2

Q78 Have you ever had any of the symptoms mentioned in the previous two questions?

Yes	1	
No	2	Skip to Q80

Q79 Did you do any of the following the last time you had a genital ulcer/sore or genital discharge?

		Yes	No
Q79a	Seek advice/medicine from a government clinic or hospital?	1	2
Q79b	Seek advice/medicine from a private clinic or hospital?	1	2
Q79c	Seek advice/medicine from the school nurse?	1	2
Q79d	Seek advice/medicine from a church run clinic or hospital?	1	2
Q79e	Seek advice/medicine from an NGO run clinic?	1	2
Q79f	Seek advice/medicine from a pharmacy?	1	2
Q79g	Seek advice/medicine from a traditional healer?	1	2
Q79h	Seek advice/medicine from a friend?	1	2
Q79i	Took medicine you had at home?	1	2
Q79j	Tell your sexual partner about the discharge/STD?	1	2
Q79k	Stop having sex while you had the symptoms?	1	2
Q79l	Use a condom when having sex while you had the symptoms?	1	2

Q80 What is the relationship between HIV and AIDS?	TRUE	FALSE
HIV causes AIDS	1	2
AIDS causes HIV	1	2
HIV and AIDS are the same thing	1	2
HIV and AIDS are not related	1	2

Q81 Do you have a close relative or close friend who is infected with HIV or has died of AIDS?

Yes a relative	1
Yes a close friend	2

Q82 How, if at all, can transmission of HIV be prevented?	TRUE	FALSE
Q82a It cannot	1	2
Q82b Not have sex if suspect person has HIV or AIDS	1	2
Q82c Only have one faithful uninfected partner	1	2
Q82d Only have a few partners at a time	1	2
Q82e Only have one sexual partner at any one time	1	2
Q82f Use a condom when you feel it is important to do so	1	2
Q82g CHECK ALL THAT APPLY Use a condom every time you have sex	1	2
Q82h Use another contraceptive (not a condom) every time you have sex	1	2
Q82i Avoid contamination with infected blood	1	2
Q82j Drug treatment of infected pregnant woman to prevent vertical transmission	1	2
Q82k Avoid sharing a needle or syringe with someone	1	2
Q82l Avoid sharing a meal with someone who is infected	1	2
Q82m Abstain from sex	1	2

Q83 Do you think that a healthy-looking person can be infected with HIV?

Yes	1
No	2

Q84 Do you view people who have HIV in a bad way?

Yes	1
No	2

Q85 Can a pregnant woman infected with HIV transmit the virus to her unborn child?

Yes	1
No	2

Q86 What can a pregnant woman with HIV do to reduce the risk of transmission of HIV to her unborn child?

Enroll in PMTCT and take medication	1
Do nothing	2

Q87 Can a woman with HIV transmit the virus to her newborn child through breastfeeding?

Yes	1
No	2

Q88 Is there a place you can go for an HIV test in your community?

Yes	1
No	

Q89 Have you ever been tested for HIV?

Yes	1	
No	2	Skip to Q96

Q90 How many times have you been tested for HIV?

One time	1
Two to three times	2
More than four times	3

Q91 When did you have your most recent HIV test?

Less than 1 year ago	1
Between 1-2 years ago	2
Between 2-4 years ago	3
More than 4 years ago	4

Q92 Did you find out the result of your most recent HIV test?

Yes	1
No	2

Q93 What was the result of your most recent HIV test?

Positive	1
Negative	2

Q94a If you tested HIV positive, did you seek care?

Yes	1
No	2

Q94b If you tested HIV positive, were you told you need ARVs?

Yes	1
No	2

Q94c If you tested HIV positive, are you currently on ARV treatment?

Yes	1
No	2

Q95	What was the main reason for your most recent HIV test?	Yes	No
Q95a	To keep healthy	1	2
Q95b	Blood donation	1	2
Q95c	Male circumcision	1	2
Q95d	Concern about a partner	1	2
Q95e	Concern about own status	1	2
Q95f	Had genital sore/discharge	1	2
Q95g	Found that partner had HIV	1	2
Q95h	I'm sexually active	1	2
Q95i	Sponsorship	1	2
Q95j	Encouraged by counselor/teacher	1	2
Q95k	Encouraged by peer educator	1	2
Q95l	Victim of rape	1	2
Q95m	TV message/Radio message	1	2
Q95n	Encouraged by parents/family/peer/ teacher/	1	2
Q95o	Encouraged by peers	1	2
Q95p	Pregnancy	1	2
Q95q	To get married	1	2

Q96	What was the main reason you did not go for an HIV test?	Yes	No
Q96a	Scared to know status	1	2
Q96b	I don't think it's necessary/not at risk	1	2
Q96c	I'm not allowed to go alone	1	2
Q96d	Someone might see me	1	2
Q96e	I just don't want to know	1	2
Q96f	No transport	1	2
Q96g	I'm indifferent	1	2
Q96h	No time to go	1	2
Q96i	I don't want my parents to know	1	2
Q96j	Don't know of any place to go	1	2
Q96k	My boyfriend/girlfriend did not want me to go	1	2
Q96l	I did not know what I would do if I were positive	1	2
Q96m	I did not know I could get free treatment	1	2

Section 7: Exposure to interventions for HIV prevention (The following questions ask about health programs in your school).

Q97 Have you been exposed to Window of Hope Life Skills materials?

Yes	1	
No	2	Skip to Q104

Q98 Which of the following topics have you covered under the Window of Hope Life Skills materials?

		YES	NO
Q98a	Self-awareness	1	2
Q98b	Values	1	2
Q98c	Goals setting	1	2
Q98d	Communication	1	2
Q98e	Decision making	1	2
Q98f	Stress management	1	2
Q98g	Sexuality	1	2
Q98h	HIV and AIDS facts, myths and prevention	1	2
Q98i	Risk reduction	1	2
Q98j	Benefits of relationships	1	2
Q98k	Dilemma	1	2
Q98l	Social responsibility	1	2
Q98m	Healthy living	1	2

Q99 Of the topics covered, which one do you think is most relevant to your personal life? Check only that applies the most

		YES	NO
Q99a	Self-awareness	1	2
Q99b	Values	1	2
Q99c	Goals setting	1	2
Q99d	Communication	1	2
Q99e	Decision making	1	2
Q99f	Stress management	1	2
Q99g	Sexuality	1	2
Q99h	HIV and AIDS facts, myths and prevention	1	2
Q99i	Risk reduction	1	2
Q99j	Benefits of relationships	1	2
Q99k	Dilemma	1	2
Q99l	Social responsibility	1	2
Q99m	Healthy living	1	2

Q100 Which is your favorite		lesson or activity in the Window of Hope?		
			YES	NO
Q100a		Self-awareness	1	2
Q100b		Values	1	2
Q100c		Goals setting	1	2
Q100d		Communication	1	2
Q100e		Decision making	1	2
Q100f	CHECK	Stress management	1	2
ONLY				
Q100g	ONE THAT	Sexuality	1	2
Q100h	APPLIES MOST	HIV and AIDS facts, myths and	1	2
prevention				
Q100i		Risk reduction	1	2
Q100j		Benefits of relationships	1	2
Q100k		Dilemma	1	2
Q100l		Social responsibility	1	2
Q100m		Healthy living	1	2

Q101 Which types of activities were the best for you? (check only that applies the most)

Q101a		YES	NO
Q101b	Individual work	1	2
Q101c	Pair work	1	2
Q101d	Group work		
Q101e	Group discussion	1	2
Q101f	Class discussion	1	2
Q101g	Brainstorming	1	2
Q101h	Role play	1	2
Q101i	Debate	1	2
Q101j	Exercises	1	2
	Composition	1	2

Q102 How much time do you spend on the materials in class?

<1 hour per week	1
1 hour per week	2
1 hour per month	3
No time	4

Q103 Would you like to spend more time on the materials?	Yes	1
	No	2

Q103a Do you ever practice what you learned during your Window of Hope Lessons in your real life?

Yes	1
No	2

Q104 This program has led me to change my behavior….

	Strongly Agree	Agree	No opinion	Disagree	Strongly Disagree	
Window of Hope	5	4	3	2	1	0
PACT	5	4	3	2	1	0
Peer educator from Face the Nation to talk about abstinence	5	4	3	2	1	0
GBEM	5	4	3	2	1	0
Makgabaneng	5	4	3	2	1	0
PSI Choose Life	5	4	3	2	1	0
Hope world wide	5	4	3	2	1	0
SAPSSI 5	4	3	2	1	0	
Ringing the Bell	5	4	3	2	1	0
Talk Back	5	4	3	2	1	0

Section 8: Dietary Behaviors and Hygiene (The next set of questions ask about eating habits and hygiene)

Q105 Before going to school, what do you normally eat for breakfast?

		YES	NO
Q105a	Nothing	1	2
Q105b	Cereals/Porridge	1	2
Q105c	Bread	1	2
Q105d	Fruit	1	2
Q105e	Tea/Coffee	1	2
Q105f	Juice	1	2
Q105g	Milk	1	2

Q106a During the past 7 days, how many times did you drink 100% fruit juice such as orange juice, apple juice, or grape juice? (Do not count punch Kool-Aid, sports drinks, or other fruit-flavored drinks)

I did not drink 100% fruit juice during the past 7 days	1
1 to 3 times during the past 7 days	2
4 to 6 times during the past 7 days	3
1 time per day	4
2 times per day	5
3 times per day	6
4 or more times per day	7

Q106b During the past 7 days, how many times did you drink a can, bottle, or glass of soda drink, such as Coke, Pepsi, or Sprite? (Do not count diet soda drink like coke light/diet….)

I did not drink fizzy drinks during the past 7 days	1
1 to 3 times during the past 7 days	2
4 to 6 times during the past 7 days	3
1 time per day	4
2 times per day	5
3 times per day	6
4 or more times per day	7

Q106c During the past 7 days, how many times did you eat fruit? (Do not count fruit juice.)

I did not eat fruit during the past 7 days	1
1 to 3 times during the past 7 days	2
4 to 6 times during the past 7 days	3
1 time per day	4
2 times per day	5
3 times per day	6
4 or more times per day	7

Q106d During the past 7 days, how many times did you eat savory snacks such as fat cakes, pies, chips or French fries/mafresh?

I did not eat these savory snacks during the past 7 days	1
1 to 3 times during the past 7 days	2
4 to 6 times during the past 7 days	3
1 time per day	4
2 times per day	5
3 times per day	6
4 or more times per day	7

Q106e During the past 7 days, how many times did you eat potatoes? (Do not count french fries/mafresh, fried potatoes, or potato chips/crisps.)

I did not eat potatoes during the past 7 days	1
1 to 3 times during the past 7 days	2
4 to 6 times during the past 7 days	3
1 time per day	4
2 times per day	5
3 times per day	6
4 or more times per day	7

Q106f During the past 7 days, how many times did you eat cabbage or spinach?

I did not eat spinach during the past 7 days	1
1 to 3 times during the past 7 days	2
4 to 6 times during the past 7 days	3
1 time per day	4
2 times per day	5
3 times per day	6
4 or more times per day	7

Q106g During the past 7 days, how many times did you eat other vegetables? (Do not count green salad, potatoes, cabbage or spinach)

I did not eat other vegetables during the past 7 days	1
1 to 3 times during the past 7 days	2
4 to 6 times during the past 7 days	3
1 time per day	4
2 times per day	5
3 times per day	6
4 or more times per day	7

Q106h During the past 7 days, how many times did you eat grains such as samp, pap, sorghum (bogobe), maize meal, or porridge?

I did not eat these grains during the past 7 days	1
1 to 3 times during the past 7 days	2
4 to 6 times during the past 7 days	3
1 time per day	4
2 times per day	5
3 times per day	6
4 or more times per day	7

Q106i During the past 7 days, how many times did you eat beef, chicken, or other meats? (Do not include hot dogs or meat in pies).

I did not eat meats during the past 7 days	1
1 to 3 times during the past 7 days	2
4 to 6 times during the past 7 days	3
1 time per day	4
2 times per day	5
3 times per day	6
4 or more times per day	7

Q106j During the past 30 days, how often did you go hungry because there was not enough food in your home?

Never	1
Rarely	2
Sometimes	3
Most of the time	4
Always	5

Q107 During the school year, were you taught in any of your classes the benefits of healthy eating?

Yes	1
No	2

Q108 During the school year, were you taught in any of your classes about what is a normal/healthy weight?

Yes	1
No	2

Q109 During the past 7 days, on how many days were you physically active for a total of at least 60 minutes per day? (Add up all the time you spent in any kind of physical activity that increased your heart rate and made you breathe hard some of the time)

0 days	1
1 day	2
2 - 3 days	3
4 days	4
5 days	5
6 days	6
7 days	7

Q110 What kind of physical exercise do you do each day outside of school?

I do not do any physical activity	1
I walk to school	2
I play sports	3
I run	4
I ride a bicycle	5

Q111 On an average school day, how many hours do you watch TV?

I do not watch TV on an average school day	1
Less than 1 hour per day	2
1 hour per day	3
2 hours per day	4
3 hours per day	5
4 hours per day	6
5 or more hours per day	7

Q112 On an average school day, how many hours do you play video or computer games or use a computer for something that is not school work? (Include activities such as Xbox, PlayStation, Nintendo DS, iPod touch, Facebook, and the Internet.)

I do not play video or computer games or use a computer for something that is not school work	1
Less than 1 hour per day	2
1 hour per day	3
2 hours per day	4
3 hours per day	5
4 hours per day	6
5 or more hours per day	7

Q113 In an average week when you are in school, on how many days do you go to physical education (PE) classes?

0 days	1
1 day	2
2 days	3
3 days	4
4 days	5
5 days	6

Q114 During the past 12 months, on how many sports teams did you play? (Count any teams run by your school or community groups.)

0 teams	1
1 team	2
2 teams	3
3 or more teams	4

Q115 How often do you wash your hands before eating?

Never	1
Rarely	2
Sometimes	3
Most of the time	4
Always	5

Q117 How often do you wash your hands after using the toilet or latrine?

Never	1
Rarely	2
Sometimes	3
Most of the time	4
Always	5

Q118 How often do you use soap when washing your hands?

Never	1
Rarely	2
Sometimes	3
Most of the time	4
Always	5

Q119 Do you brush your teeth every day after each time you eat?

Never	1
Sometimes	2
Always	3

Q120 Do you brush your teeth every day before you go to sleep?

Yes	1
No	2

Section 9: Mental Health and Safety

The next set of questions will ask about your mental health. Mental health can be thought of as the state of your well-being in which you realize your own abilities, you can cope with the normal stresses of life, you can work productively, and you are able to make a positive contribution to the people around you. Remember, your name is not collected

Q121 What do you do when you are not in school?

ANSWER TO EACH OF THESE

		YES	NO
Q121a	Watch TV	1	2
Q121b	Play with my friends	1	2
Q121c	Drink beer	1	2
Q121d	Spend time with my boyfriend/girlfriend	1	2
Q121e	Play sports	1	2
Q121f	Work	1	2
Q121g	Chores	1	2
Q121h	Do homework	1	2
Q121i	Listen to music	1	2
Q121j	Reading books	1	2
Q121k	Play video games	1	2

Q122 What kinds of things do you sometimes worry about?

ANSWER TO EACH OF THESE

		YES	NO
Q122a	Food	1	2
Q122b	Family	1	2
Q122c	Grades	1	2
Q122d	Relationships with friends	1	2
Q122e	Relationships with boyfriends	1	2
Q122f	Relationships with girlfriends	1	2
Q122g	My health	1	2
Q122h	My future	1	2

Q123 What do you do to help reduce your worries?

		YES	NO
Q123a	Talk to Pastor	1	2
Q123b	Talk to teacher	1	2
Q123c	Go to see sugar daddy/mummy	1	2
Q123d	Pray	1	2
Q123e	Eat	1	2
Q123f	Shut myself in my room	1	2
Q123g	Take alcohol	1	2
Q123h	Take cigarettes	1	2
Q123i	Talk to my friends	1	2
Q123j	Talk to family members	1	2
Q123k	Take a walk	1	2

The next questions ask about sad feelings and attempted suicide (killing yourself). Sometimes people feel so depressed about the future that they may consider attempting suicide that is, taking some action to end their own life. Remember, your answers will be kept private. Also, keep in mind that some of these questions may not apply to you. The reasons behind suicide are difficult to define. Some reasons may include despair, hopelessness, illness, humiliation, loss of employment, loss of a relationship, death in the family, and guilt.

Q124 During the past 12 months, did you ever feel so sad or hopeless almost every day for two weeks or more in a row that you stopped doing some usual activities?

Yes	1
No	2

Q125 During the past 12 months, did you ever seriously consider attempting suicide?

Yes	1
No	2

Q126 During the past 12 months, did you make a plan about how you would attempt suicide?

Yes	1
No	2

Q127 During the past 12 months, how many times did you actually attempt suicide?

0 times	1
1 to 3 times	2
4 to 5 times	3
6 or more times	4

Q130 If you attempted suicide during the past 12 months, did any attempt result in an injury, poisoning, or overdose that had to be treated by a doctor or nurse?

Yes	1
No	2
I did not attempt suicide during the past 12 months	3

Q131 On average, when you look at yourself in the mirror what do you believe you see?

Someone who is confident.	1
Someone who is unsure about what to do in life	2

The next questions ask about safety.

Q132 When you rode a bicycle during the past 12 months, how often did you wear a helmet?

I did not ride a bicycle during the past 12 months	1
Never wore a helmet	2
Rarely wore a helmet	3
Sometimes wore a helmet	4
Most of the time wore a helmet	5
Always wore a helmet	6

Q133 How often do you wear a seat belt when riding in a car driven by someone else?

Never	1
Rarely	2
Sometimes	3
Most of the time	4
Always	5

Q134 During the past 30 days, how many times did you ride in a car or other vehicle driven by someone who had been drinking alcohol?

0 times	1
1 day 2 or 3 times	2
4 or 5 times	3
6 or more times	4

Q135 During the past 30 days, how many times did you drive a car or other vehicle when you had been drinking alcohol?

0 times	1
1 day 2 or 3 times	2
4 or 5 times	3
6 or more times	4

Section 11: Crime and Violence

The next questions ask about violence-related behaviors. The questions are about the times if and when you were physically or emotionally hurt.

Q136 During the past 30 days, on how many days did you carry a weapon, such as a gun, knife or catapult?

0 days	1
1 day 2 or 3 days	2
4 or 5 days	3
6 or more days	4

Q137 During the past 30 days, on how many days did you carry a weapon, such as a gun, knife or catapult on school property?

0 days	1
1 day 2 or 3 days	2
4 or 5 days	3
6 or more days	4

Q138 During the past 30 days, on how many days did you not go to school because you felt you would be unsafe at school or on your way to or from school?

0 days	1
1 day 2 or 3 days	2
4 or 5 days	3
6 or more days	4

Q139 During the past 12 months, how many times has someone threatened or injured you with a weapon such as a gun, knife, or club on school property?

0 times	1
1 time	2
2 or 3 times	3
4 or 5 times	4
6 or 7 times	5
8 or 9 times	6
10 or 11 times	7
12 or more times	8

Q140 During the past 12 months, how many times were you in a physical fight?

0 times	1
1 time	2
2 or 3 times	3
4 or 5 times	4
6 or 7 times	5
8 or 9 times	6
10 or 11 times	7
12 or more times	8

Q141 During the past 12 months, how many times were you in a physical fight in which you were injured and had to be treated by a doctor or nurse?

0 times	1
1 time	2
2 or 3 times	3
4 or 5 times	4
6 or more times	5

Q142 During the past 12 months, how many times were you in a physical fight on school property?

0 times	1
1 time	2
2 or 3 times	3
4 or 5 times	4
6 or 7 times	5
8 or 9 times	6
10 or 11 times	7
12 or more times	8

Q143 During the past 12 months, did your boyfriend or girlfriend ever hit, slap, or physically hurt you on purpose?

Yes	1
No	2

Q144 Have you ever been physically forced to have sexual intercourse when you did not want to?

Yes	1
No	2

Q145 During the past 30 days, how often have you been emotionally abused by your teacher?

Never	1
Once	2
Every week	3
Everyday	4

Q146 During the past 30 days, how often have you been emotionally abused by your family?

Never	1
Once	2
Every week	3
Everyday	4

Q147 During the past 30 days, how often have you been emotionally abused by your boyfriend/girlfriend?

Never	1
Once	2
Every week	3
Everyday	

Q148 During the past 30 days, how many times has someone threatened or injured you with a weapon such as a knife?

0 times	1
1 time	2
2 or 3 times	3
4 or 5 times	4
6 or more times	5

The next questions ask about bullying Bulling is when 1 or more students tease, threaten, spread rumors about, hit, shove, or hurt another student over and over again. It is not bullying when 2 students of about the same strength or power argue or fight or tease each other in a friendly way.

Q149 During the past 12 months, have you ever been picked on / bullied on school property?

Yes	1
No	2

Q150 During the past 12 months, have you ever been electronically bullied? (Include being bullied through e-mail, chat rooms, instant messaging, Web sites, or texting)

Yes	1
No	2

Q151 During the past 30 days, how did you respond to being picked on or bullied?

I skipped school	1
Reported to the teacher	2
Told my parents	3
I fought back	4
I did nothing	5

This is the end of our questionnaire. Thank you very much for taking the time to answer these questions. We greatly appreciate your help.

Mr T. C. Zulu
HIV and AIDS Coordinator for the Ministry of Education

APPENDIX 4: JOURNAL MANUSCRIPT INSTRUCTIONS

Original Research Article

An original article provides an overview of innovative research in a particular field within or related to the focus and scope of the journal, presented according to a clear and well-structured format.

Submission status	open
Word limit	3500-5000 words (excluding the abstract, tables, figures, graphs, and references)
Abstract	maximum: 250 words requires structural headings: Background, Objectives, Method, Results, Conclusion and What this study adds
Main text	requires structural headings, refer to the full structure 'Ethical considerations' is a sub-section in the manuscript and must include: Name of the ethical review committee Study approval number Manner of consent (written, oral) for human participants Description of measures taken to maintain the confidentiality of data If the study was not human or animal research or the study was determined to be non-human subjects research or exempt, the authors must provide a statement with those details in this section.
References	60 or less, adhere to the **Vancouver referencing style**
Tables, figures and graphs	7 or less, adhere to the Illustrations requirements found in the AOSIS House style guide
Formatting requirements	apply the guidelines located on the **Formatting requirements page** and the **AOSIS house style guide**
Compulsory supplementary file(s)	the **Authorship, disclosure statements, copyright, and license agreement form**, **Ethical Clearance/Waiver Documentation** and any other relevant form applicable to your submission
Ethical clearance/waiver documentation	evidence of ethical clearance for the study, such as the study approval letter or certificate from the Institutional Review Board (IRB), a waiver from the IRB et cetera

Original Research Article full structure

Title: The article's full title should contain a maximum of 95 characters (including spaces).

Abstract: The abstract, written in English, should be no longer than 250 words and must be written in the past tense. The abstract should give a succinct account of the objectives, methods, results and significance of the matter. The structured abstract for an Original Research article should consist of six paragraphs labelled Background, Objectives, Method, Results, Conclusion and What this study adds.

- Background: *Why do we care about the problem?* State the context and purpose of the study. (What practical, scientific or theoretical gap is your research filling?)
- Objectives: *What problem are you trying to solve*? What is the scope of your work (e.g. is it a generalised approach or for a specific situation)? Be careful not to use too much jargon.
- Method: *How did you go about solving or making progress on the problem*? State how the study was performed and which statistical tests were used. (What did you actually do to get the results?) Clearly express the basic design of the study; name or briefly describe the basic methodology used without going into excessive detail. Be sure to indicate the key techniques used.
- Results: *What is the answer*? Present the main findings (that is, as a result of completing the procedure or study, state what you have learnt, invented or created). Identify trends, relative changes or differences on answers to questions.
- Conclusion: *What are the implications of your answer*? Briefly summarise any potential implications. (What are the larger implications of your findings, especially for the problem or gap identified in your motivation?)
- What this study adds: What key insights into the research results and its future function are revealed? How do these insights link to the focus and scope of the journal? It should be a concise statement of the primary contribution of the manuscript; and how it fits within the scope of the journal.
  Do not cite references and do not use abbreviations excessively in the abstract.

Introduction: The introduction must contain your argument for the social and scientific value of the study, as well as the aim and objectives:

- Social value: The first part of the introduction should make a clear and logical argument for the importance or relevance of the study. Your argument should be supported by the use of evidence from the literature.
- Scientific value: The second part of the introduction should make a clear and logical argument for the originality of the study. This should include a summary of what is already known about the research question or specific topic and should clarify the knowledge gap that this study will address. Your argument should be supported by the use of evidence from the literature.
- Conceptual framework: In some research articles it will also be important to describe the underlying theoretical basis for the research and how these theories are linked together in a conceptual framework. The theoretical evidence used to construct the conceptual framework should be referenced from the literature.
- Aim and objectives: The introduction should conclude with a clear summary of the aim and objectives of this study.

Research methods and design: This must address the following:

- Study design: An outline of the type of study design.
- Setting: A description of the setting for the study; for example, the type of community from which the participants came or the nature of the health system and services in which the study is conducted.
- Study population and sampling strategy: Describe the study population and any inclusion or exclusion criteria. Describe the intended sample size and your sample size calculation or justification. Describe the sampling strategy used. Describe in practical terms how this was implemented.

- Intervention (if appropriate): If there were intervention and comparison groups, describe the intervention in detail and what happened to the comparison groups.
- Data collection: Define the data collection tools that were used and their validity. Describe in practical terms how data were collected and any key issues involved, e.g. language barriers.
- Data analysis: Describe how data were captured, checked and cleaned. Describe the analysis process, for example, the statistical tests used or steps followed in qualitative data analysis.
- Ethical considerations: Approval must have been obtained for all studies from the author's institution or other relevant ethics committee and the institution's name and permit numbers should be stated here.

Results: Present the results of your study in a logical sequence that addresses the aim and objectives of your study. Use tables and figures as required to present your findings. Use quotations as required to establish your interpretation of qualitative data. All units should conform to the **SI convention** and be abbreviated accordingly. Metric units and their international symbols are used throughout, as is the decimal point (not the decimal comma).

Discussion: The discussion section should address the following four elements:

- Key findings: Summarise the key findings without reiterating details of the results.
- Discussion of key findings: Explain how the key findings relate to previous research or to existing knowledge, practice or policy.
- Strengths and limitations: Describe the strengths and limitations of your methods and what the reader should take into account when interpreting your results.
- Implications or recommendations: State the implications of your study or recommendations for future research (questions that remain unanswered), policy or practice. Make sure that the recommendations flow directly from your findings.

Conclusion: Provide a brief conclusion that summarises the results and their meaning or significance in relation to each objective of the study.

Acknowledgements: Those who contributed to the work but do not meet our authorship criteria should be listed in the Acknowledgments with a description of the contribution. Authors are responsible for ensuring that anyone named in the Acknowledgments agrees to be named. Refer to the acknowledgement structure guide on our *Formatting Requirements* page.

Also provide the following, each under their own heading:

- Competing interests: This section should list specific competing interests associated with any of the authors. If authors declare that no competing interests exist, the article will include a statement to this effect: *The authors declare that they have no financial or personal relationship(s) that may have inappropriately influenced them in writing this article.* Read our **policy on competing interests**.
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