PERCEPTIONS OF LONG-ACTING HIV PRE-EXPOSURE PROPHYLAXIS AND PREFERENCES FOR SERVICE DELIVERY AMONG YOUNG WOMEN IN TERTIARY INSTITUTIONS IN SOUTH AFRICA

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A THESIS BY PUBLICATION

Submitted to Wits RHI, Faculty of Health Sciences, University of the Witwatersrand, in fulfilment of the requirements for the degree of

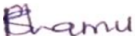
Doctor of Philosophy

JOHANNESBURG, SOUTH AFRICA

September 2025

DECLARATION

I, Patience Shamu, student number 1561506, declare that this thesis is my original work. It is being submitted for the degree of Doctor of Philosophy in Clinical Medicine, at the University of the Witwatersrand, Johannesburg, South Africa. It has not been submitted before for any degree or examination at this or any other university. I have read the sections on referencing and plagiarism in the Wits Plagiarism Policy. I am aware that plagiarism is wrong and that the University of the Witwatersrand may take disciplinary action should plagiarism be found in this work. I have followed the required conventions in referencing the thoughts and ideas of others. I confirm that all of the work submitted in this thesis is my own work.

Signature: 

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DEDICATION

To my daughter Maka

ACKNOWLEDGEMENTS

"If I have seen further, it is by standing on the shoulders of giants"

- Sir Isaac Newton

I dedicate this work to the following people:

Thank you to my supervisors, Prof Nicola Christofides and Prof Saiqa Mullick, for their unwavering support. I greatly appreciate their encouragement and dedication to the successful completion of this work.

I greatly appreciate the students who sacrificed their time to participate in this study. Their contributions are invaluable and will always be appreciated. I also appreciate all the authorities that granted us access to the tertiary institutions.

I also dedicate this work to my dear husband, Simukai, who supported me throughout the PhD journey in many ways. I appreciate his encouragement throughout this journey, especially when I felt like quitting. His prayers kept me going. I am grateful for how he cared for our kids, especially while I was away from home attending writing retreats and seminars.

To my children: Terry, Maka, and Tavonga Shamu, thank you for your support, encouragement, and prayers. I appreciate the times you endured my absence as I was away from home on writing retreats.

I am grateful to my mother (Mrs Florence Chengeto Mahonah) and my father (Mr Calbern Mahonah) for their encouragement throughout this journey and for always believing in me from my childhood. In addition, I am grateful for the encouragement I received from my mother-in-law, Mrs Sylvia Shamu. She kept checking on me throughout my journey, and it kept me going.

To my siblings Alfred, Romeo, Priscilla, and Percy Mahonah, your love is priceless.

I am privileged to be funded and supported by the Consortium for Advanced Research Training in Africa (CARTA). Without the support from CARTA, this PhD would not have been possible. The Joint Advanced Seminars and the funded writing retreats made the PhD doable. I am also very grateful to the CARTA Cohort 10 Fellows who were a great part of my PhD journey.

I appreciate the support and special encouragement I received from the following people: Mukoma [brother] Tapiwa Nyakabau, sisi [sister] Nana Manu-Mabiza, Dr Mercy Murire, and Miss Tari Matare. You guys were so God-sent! Your encouragement and consistent checking on me made my PhD bearable.

Without the help of God through His son Jesus Christ, this work would not have been possible. I greatly appreciate the spiritual support I got through the body of Christ, especially my pastors and their spouses:

Reverend Murambadoro and Mrs Murambadoro, Reverend Dr Munikwa and Mrs Munikwa, Reverend Munenerwa and Mrs Munenerwa, Reverend Musakwa, Reverend Chandipwisa and Mrs Chandipwisa, and Pastor Chamu. Thank you for your prayers and encouragement; without these prayers, I would not have finished this PhD. May God continue to anoint and empower you so you can continue to touch many lives.

OUTPUTS GENERATED FROM THE PHD

List of papers submitted as part of thesis

1. **Patience Shamu**, Nicola J Christofides and Saiqa Mullick *(*2025) Facilitators and barriers to contraceptive uptake and use: Perspectives of female students in South Africa and lessons for quality provision of HIV pre-exposure prophylaxis. *PLoS One* 20(9): e0333270. **https://doi.org/10.1371/journal.pone.0333270**
2. **Patience Shamu**, Saiqa Mullick and Nicola J Christofides. Perceptions of the attributes of new long-acting HIV Pre-Exposure Prophylaxis formulations compared with a daily, oral dose among South African young women: A qualitative study. *AIDS Care*: **DOI 10.1080/09540121.2024.2383878**
3. **Patience Shamu**, Saiqa Mullick and Nicola J. Christofides. Service delivery characteristics preferences and trade-offs for long-acting injectable pre-exposure prophylaxis among female students in tertiary Institutions in South Africa: A Discrete Choice Experiment. *Global Public Health***: DOI 10.1080/17441692.2025.2489710**

Conference presentations

1. **P. Shamu**, N.J Christofides and S. Mullick. **Oral presentation**. Perceptions of female South African students in tertiary institutions on barriers to uptake of current contraceptive offerings: Implications for delivery of HIV long-acting Pre-Exposure. Presented at the 10th Annual Joint Advanced Seminar Conference, School of Public Health, Makerere University, Uganda,18 August 2023.
2. **P. Shamu**, N.J, S Mullick and N.J Christofides. **Awarded the best poster presentation.** Perceptions of the attributes of new long-acting HIV Pre-Exposure Prophylaxis formulations compared with a daily, oral dose among South African young women: A qualitative study. Presented at the Wits School of Public Health and CARTA Conference, Johannesburg, South Africa, September 2023.
3. **P. Shamu**, N.J, S Mullick and N.J Christofides. **Poster presentation**. Perceptions of the attributes of new long-acting HIV Pre-Exposure Prophylaxis formulations compared with a daily, oral dose among South African young women: A qualitative study, ICASA Conference, Harare, Zimbabwe, December 2023

Fellowships

Patience Shamu was supported by the Consortium for Advanced Research Training in Africa (CARTA). CARTA is jointly led by the African Population and Health Research Centre and the University of the Witwatersrand and funded by the Carnegie Corporation of New York (Grant No. G-19-57145), Sida (Grant No:54100113), Uppsala Monitoring Centre, Norwegian Agency for Development Cooperation (Norad), and by the Welcome Trust [reference no. 107768/Z/15/Z] and the UK Foreign, Commonwealth & Development Office, with support from the Developing Excellence in Leadership, Training and Science in Africa (DELTAS Africa) programme. The statements made and views expressed are solely the responsibility of the Fellow.

ABSTRACT

Introduction: Despite various HIV prevention strategies, such as free condom distribution and post-exposure prophylaxis (PEP), HIV remains a global challenge. Adolescent girls and young women (AGYW), particularly in sub-Saharan Africa, account for nearly two-thirds of new infections. Oral pre-exposure prophylaxis (PrEP), introduced in South Africa in 2016, has proven effective but faces low uptake among youth due to daily pill requirements and side effects. Recently approved long-acting methods, including injectable cabotegravir (CAB-LA) and the dapivirine vaginal ring (DVR), provide promising alternatives but require effective delivery strategies tailored to young women. This PhD study examines the PrEP preferences of young women in tertiary institutions in South Africa and identifies which attributes of service delivery they prioritise.

Methods: This study used a sequential exploratory mixed-methods approach, collecting data from August 2022 to October 2023. The qualitative phase explored young women's experiences with contraceptive services, focusing on barriers, facilitators, and perceptions of long-acting PrEP technologies. It included 22 in-depth interviews and five focus group discussions, analysed using a thematic approach guided by the socio-ecological and diffusion of innovation models, with NVivo 12 software. A nominal group technique identified service delivery attributes, which informed the development of a discrete choice experiment (DCE). The DCE quantitatively assessed service delivery priorities through trade-offs among 400 participants, with data collected via computer tablets, stored in REDCap, and analysed in Stata 16 using mixed logit and latent class models.

Results: We identified multi-level factors influencing contraceptive service utilisation and PrEP method preferences among young women. Individual-level barriers included method discontinuation, primarily due to side effects, while health system barriers centred on negative provider attitudes that deterred service access. Family-level facilitators highlighted mothers' pivotal role in enabling contraceptive use through emotional and logistical support. Regarding PrEP method preferences, CAB-LA was favoured for its lifestyle compatibility, whereas oral PrEP was least preferred due to daily dosing requirements. DVR faced scepticism stemming from discomfort with vaginal insertion of the ring. From the DCE, we found that campus clinics were preferred over public clinics, and young women preferred to return to the clinic for support in managing side effects rather than using digital tools such as

chatbots. They also preferred providers who were good listeners and specialists in PrEP provision.

Conclusion: Young women's preference for long-acting CAB-LA stems from its lifestyle compatibility and alignment with injectable contraceptives such Nuristerate, enabling opportunities for integrated service delivery. Youth-friendly providers are critical for PrEP accessibility, requiring ongoing training to address stigma and foster non-judgmental care. Campus-based clinics are prioritised by tertiary students, necessitating expansion to reduce barriers. The National Department of Health should scale up nurse training in youth-friendly services and invest in targeted awareness campaigns to address low PrEP literacy, including among mothers and partners. A multipronged approach, combining service integration, provider sensitisation, and demand creation, is essential to ensure sustained method use.

LIST OF ABBREVIATIONS AND ACRONYMS

AGYW	Adolescent Girls and Young Women
ARV	Antiretroviral
CAB-LA	Injectable Cabotegravir
CAPS	Curriculum and Assessment Policy Statement
CHC	Community Health Centre
CPR	Contraceptive Prevalence Rate
CSE	Comprehensive Sexual Education
DCE	Discrete Choice Experiment
DOI	Diffusion of Innovations
DREAMS	Determined, Resilient, Empowered, AIDS-free, Mentored and Safe
DSD	Differentiated Service Delivery
DVR	Dapivirine Vaginal Ring
EMA	European Medicines Agency
FC	Female Condom
FGD	Focus Group Discussion
FSW	Female Sex Worker
HER	Electronic Health Record
ICF	Informed Consent Form
IDI	In-Depth Interview
IPV	Intimate Partner Violence
LARC	Long-acting Reversible Contraceptives
LEN	Lenacapavir
MSM	Men who have sex with men
NDoH	National Department of Health
NGO	Non-Governmental Organisation
NIH	National Health Insurance
NGT	Nominal Group Technique
PEP	Post Exposure Prophylaxis
PhD	Doctor of Philosophy
PI	Principal Investigator

PIS	Participant Information Sheet
PrEP	Pre-exposure Prophylaxis
RCT	Randomised Control Trials
RUT	Random Utility Theory
SAHPRA	South African Health Products Regulatory Authority
SDOH	Social Determinants of Health
SEM	Socio-Ecological Model
SSA	sub-Saharan Africa
TasP	Treatment as Prevention
TVET	Technical Vocational Education and Training
UNAIDS	Joint United Nations Programme on HIV/AIDS
UNFPA	United Nations Population Fund
USAID	United States Agency for International Development
VL	Viral Load
VMMC	Voluntary Medical Male Circumcision
WHO	World Health Organisation
WTP	Willingness to Pay

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Chapter 1: INTRODUCTION

1.1 Background

HIV remains a global public health issue. An estimated 39.9 million people were living with HIV in 2023 (1). South Africa is the epicentre of the HIV epidemic, with an estimated eight million people living with HIV (PLHIV) (2). New HIV infections are not declining fast enough, and the globally agreed target of a 75% reduction by 2020 from the 2010 baseline was missed (3,4). Nearly 60% of PLHIV in Eastern and Southern Africa are women aged 15 years and older (1). Adolescent girls and young women (AGYW) are disproportionately affected by HIV. Globally, an estimated 46% of new HIV infections were reported among AGYW, and in sub-Saharan Africa (SSA), this group contributed 77% of new infections (5). In 2022, over 4,000 new infections occurred among AGYW every week, three-quarters of which were in SSA (5).

HIV incidence among young people, especially AGYW (15-24 years) in South Africa, remains high, with an annual incidence of 1.51% compared to 0.5% among their male counterparts (6). The incidence remains high despite the existence of many HIV prevention interventions such as free condom distribution, treatment as prevention (TasP), and post-exposure prophylaxis (PEP) for sexual exposure, including unprotected sex, rape, burst condoms, and inadvertent exposure from tattooing and voluntary medical male circumcision (VMMC), among other interventions (7,8). The use of antiretroviral drugs (ARVs) as HIV pre-exposure prophylaxis (PrEP) for people not living with HIV holds promise for young women to gain control over HIV prevention. Oral PrEP is highly effective, with an estimated effectiveness of 90% (9). However, its effectiveness relies on daily pill-taking and effective use (10,11). In 2015, the World Health Organization (WHO) recommended the use of PrEP to all people at substantial risk of HIV infection as part of combination prevention (12). Following this WHO recommendation, in June 2016, the South African National Department of Health (NDoH) introduced oral PrEP using a phased rollout, starting with the female sex workers (FSW), expanding to men who have sex with men (MSM) in April 2017, and to students at selected universities and Technical Vocational Education and Training (TVET) colleges in October 2017, and finally to all AGYW (13). As guidelines were later updated in 2020, PrEP became available to additional populations considered to be at substantial risk of HIV infection, such as people

who inject drugs, serodiscordant couples, and all individuals who believed that they were at risk and requested PrEP (14).

Although young people are at the highest risk of HIV infection, they are reported to struggle with daily pill taking and continuous PrEP use (9,15). The reasons for this include pill burden, side effects, and stigma associated with taking a pill that looks like antiretrovirals (ARVs) (13,16–18). The PrEP landscape has evolved over the years since the introduction of oral PrEP, with long-acting PrEP methods like the dapivirine vaginal ring (DVR) and injectable cabotegravir (CAB-LA) recently becoming available through research projects, with the dual oral contraceptive/PrEP pill now at a late stage of development (19). Several clinical trials found tenofovir disoproxil fumarate and emtricitabine (TDF/Truvada/oral PrEP) to be effective in HIV prevention. The iPrEX study, conducted among an estimated 2,500 MSM, was the first to establish the effectiveness of daily oral PrEP, with a 44% reduction in HIV risk reported among the whole population, as many participants did not take PrEP as prescribed, compared to a 92% reduction among those who regularly took PrEP (20). In the Partners Study conducted among heterosexual partners, oral PrEP reduced HIV infection risk by 95% (21), while in the TDF2 study, conducted among heterosexual men and women, a 66% reduction was reported (22). Since most of these long-acting PrEP options are still only available through study settings, it is timely to understand potential values, preferences, and considerations for their use in HIV prevention.

Long-acting PrEP formulations, such as the DVR and CAB-LA, have now received approval in different countries. The DVR has been approved for use in 11 countries in East and Southern Africa (23): Botswana, Eswatini, Kenya, Lesotho, Malawi, Namibia, Rwanda, South Africa, Uganda, Zambia, and Zimbabwe. The DVR and the eight-weekly CAB-LA were approved by the South African Health Products Regulatory Authority (SAPHRA) in March and December 2022, respectively. The monthly oral pill, Islatravir, was discontinued in September 2022 (24). A six-monthly injectable lenacapavir (LEN) was in Phase III clinical trials. The Purpose 1 trial, conducted in South Africa and Uganda, tested the efficacy of both LEN and oral emtricitabine/tenofovir alafenamide (F/TAF) among 5,300 cisgender women. In June 2024, an early review by an independent monitoring board found LEN for HIV prevention to be safe and highly effective against HIV, with no new infections reported among the LEN users, and

it is now undergoing review for registration (25). The Purpose 2 trial is being conducted in Argentina, Brazil, Mexico, Peru, Puerto Rico, South Africa, Thailand, the USA, and Vietnam among 3,000 men who have sex with men (MSM), gender non-binary people, gay men, and transgender men and women (19). The Purpose 2 study tests whether LEN reduces the risk of getting HIV through anal sex and is designed to cater to groups that are underrepresented in trials but are disproportionately affected by HIV (26).

Considering potential users' perspectives and the service context becomes crucial as we move closer to the introduction of the new HIV prevention products, which are now available through demonstration studies in South Africa (27). There is, however, limited information on young women's preferences for how PrEP services should be delivered to facilitate uptake and continuation. Young women who use contraceptives to prevent unintended pregnancies may also be potential candidates for HIV PrEP, as they are most likely to be engaging in unprotected sex. Because the long-acting PrEP methods were not yet approved for use in South Africa at the time of the study, contraception was used as a way of exploring perceptions and experiences that could be relevant for PrEP. One study focusing on contraceptive use describes a service delivery model as how a product is provided to potential users (27). The success of the new HIV prevention technologies highlights the need to understand the acceptability of the technology itself, as well as how services should and could be organised to deliver them. Implications for service delivery preferences may also be guided by product characteristics. For example, some may be more amenable to community-based distribution, whereas others may require health professionals to administer them. This involves identifying the preferences of young women for which health cadres should provide the service, where the delivery should take place (e.g. clinics, pharmacies), and how information about the new technologies should be communicated (28). New HIV PrEP formulations such as DVR, CAB-LA, and LEN could have a greater impact on HIV prevention if young women can easily access services. Improved access can promote the uptake of these new prevention methods, including continued use of PrEP. It is important to focus on particular groups, such as students, as not only do they have busy lifestyles but they are part of the 15-24 year age group, which has the highest HIV incidence (29).

A better understanding of delivery preferences and potential demand is needed to facilitate the delivery of long-acting PrEP formulations among university students. There is, however, a dearth of knowledge on facilitators and barriers to the potential use of these long-acting PrEP formulations related to service delivery for this population. Young women's preferences reflect complex considerations that inform decision-making (30). Studies on oral PrEP have highlighted the factors that operate at individual, household, organisational, and community levels (31,32). At the individual level, these include knowledge of PrEP, side effects, age, education, self-perception of HIV risk, and perception of PrEP, among other factors (13,33,34). In the clinical trials, at the household level, friends, family, and male partners influenced DVR use (31). At the organisational level, clinic features such as the quality of staff and waiting times influence willingness to use PrEP (32,35,36). Operating at the community level are sociocultural norms, local beliefs, and HIV prevalence in the area (32,37). Studies have shown that product preference and the social environment surrounding acceptability are likely to be population-specific (38). There is, therefore, an urgent need for a dedicated study to assess the potential facilitators and barriers for DVR, LEN, and CAB-LA use among young women who are students in either universities or colleges, to inform the future rollout of these interventions. Finally, successful implementation depends on the acceptability of the intervention (39). This study employed a mixed-methods approach to identify the potential facilitators and barriers to PrEP use at different levels.

Many young people generally struggle to access sexual and reproductive health (SRH) services. SRH service utilisation by AGYW is low (40,41). Inconvenient opening hours, lack of privacy, long waiting times, and judgemental provider attitudes constitute the service delivery environment experienced by many AGYW, especially in SSA (42,43). It is important to understand the service delivery characteristics that can attract AGYW to use HIV prevention services. As service users, young people are the experts; hence, it is important to explore their perceptions and involve them in identifying attributes of service delivery that would attract them to a service.

1.1.1 The university and TVET college environment

Young women remain at a high risk of HIV infection. In 2018, South Africa was still lagging in achieving the goals of reducing new HIV infections by 50% as set in its national strategic plan (2012-2016) (44). In the 2017-2022 version of the national strategic plan for HIV, STI, and TB prevention, AGYW were prioritised (44). In addition, in 2017, the South African NDoH extended its rollout of HIV PrEP to students in tertiary institutions (13). Many young women enrolled in academic programmes at TVET colleges and universities are in the 15-24-year age group, which is most affected by HIV, with 8.5% of young people in this age group living with HIV (45,46). TVET colleges, in particular, enrol large numbers (almost 75%) of youth (16-24 years) from poor backgrounds, and poverty is known to add to one's vulnerability to HIV infection (47). Although a study conducted by the South African Higher Education and Training HIV/AIDS Programme (HEAIDS) (now known as Higher Health) showed that HIV prevalence among tertiary students was 3.4%, lower than the national prevalence of 11% (48–50), the prevalence was aggregated across campuses, and there may be variations due to the underlying prevalence in different provinces where institutions are located. In addition, despite the lower prevalence estimates at tertiary institutions, young women are at risk of acquiring HIV due to engaging in sexual intercourse for the first time, engaging in transactional sex, and increased alcohol use; therefore, prevention efforts should still focus on this population (51–53). Female students especially may face many risk factors that women in the broader population also face, as they are part of the age group and gender with the highest HIV incidence. They may also experience gender-based violence (GBV) and intimate partner violence (IPV) (54).

The university environment adds to young people's vulnerability as it brings new freedoms due to the lack of parental supervision (55). Students tend to test this freedom through sexual experimentation (56,57). For some adolescents and young people at university, it is the first time that they have autonomy and responsibility for their health (58). Some previous studies have reported on the vulnerability to HIV infection of students, especially in their first years of study, as for some, it may be the first time they are away from home and starting to make their own decisions (48). However, this autonomy can potentially lead students engage in risky sexual behaviours (59), which include having multiple partners. HEAIDS reported that

41% of female students in vocational colleges have multiple sexual partners (60). Delivering HIV prevention services to students in ways that are acceptable to them has the potential to increase their chances of service utilisation, which can ultimately contribute to a significant reduction in HIV incidence. However, little is known about students' preferences for the delivery of new HIV prevention interventions, such as DVR, LEN, and CAB-LA, which is crucial for informing future rollout (61).

1.1.2 Preferences for service delivery

Accounting for potential users' preferences is becoming a crucial component in developing new interventions for HIV prevention, including new treatments (62,63). In this respect, some important lessons have been learned from the treatment of chronic illnesses, which are being applied to HIV prevention. For example, patients and potential users of interventions are becoming more involved in making decisions about their health, recognising themselves as experts with unique knowledge of their own health, preferences, and their desired outcomes (64). HIV prevention research has increasingly been using DCEs to elicit user preferences for product design or service delivery (62). There is, however, still a dearth of literature on the characteristics of service delivery that can facilitate the uptake of new long-acting HIV prevention technologies. Studies in HIV prevention have also warned that a "one size fits all" approach will not work, and therefore stressed the need to expand choices (65). Echoing the same sentiments, in a study conducted in South Africa with women who had used various HIV prevention products, the participants expressed the need to have choices, arguing that individual women are different (66). Intervention developers are therefore under pressure to continue developing new HIV prevention interventions to reduce HIV incidence with the available resources (64,67).

As DVR and CAB-LA have become available through some studies, with LEN still in the pipeline, gaps remain in understanding user preferences for service delivery. Measuring user preferences is important for predicting acceptability, demand forecasting, sustained use, and public health impact (68). In DCEs, preferences are measured by assessing how individuals value different attributes of a product. The method assumes that goods or services can be described by a set of features or attributes, each with defined levels, or variations (62). User

preferences therefore identify the most desired characteristics from a range of alternatives (69). In South Africa, women preferred injections taken every 2-3 months and least preferred oral pills. In Kenya, women preferred monthly injections while the ring was the least preferred (70). Few studies have examined service delivery considerations.

1.1.3 Willingness to pay for PrEP

Willingness to pay (WTP) for PrEP is an important service delivery component. Service users' willingness and ability to pay help sustain a service. In addition, it also demonstrates product acceptability. Studies examining WTP have been conducted in different countries, focusing on different populations such as MSM and young people. A study conducted in ten counties in Kenya, among MSM, FSW, and AGYW, revealed that AGYW had the lowest mean WTP ($1.36) (71). In another study, also conducted in Kenya, WTP was high (61%) among young people, with almost 80% indicating a willingness to pay less than $5 for a month's supply of PrEP (72).

1.1.4 HIV and unintended pregnancies

Globally, women face overlapping sexual and reproductive health (SRH) risks (73). Unintended pregnancy and HIV infections among young women in SSA are dual challenges to achieving of the United Nations Sustainable Development Goals for 2030 (66). Young women who use contraceptives to prevent pregnancy may also be at risk of HIV infection, which makes them potential candidates for PrEP. It is against this background that this study uses contraception as a proxy for long-acting PrEP. There are also striking similarities between PrEP and contraception. Some of these similarities are in the form of delivery. The forms of delivery for both include oral pills, long-acting injectables, and vaginal rings. This variety exists because one type of contraception does not suit all women, as preferences differ. In addition, women may change their preferences at different stages of their reproductive health life cycle (74), for example they may stop when they no longer have a sexual partner (75). The same principle can be applied to PrEP for HIV prevention.

As an HIV prevention method, PrEP is more comparable to contraception than antiretroviral treatment, in that clients can use the drug whenever they feel at risk and stop when no longer

at risk (71). The field of PrEP is also learning a lot from contraception, where the importance of choice is stressed as different methods are made available to suit the needs of different people. While there are different types of contraceptive methods, they are not appropriate for all situations as appropriateness depends on the user's age, frequency, and number of sexual partners (77). Individuals with more than one sexual partner may also desire to use barrier methods, such as condoms, which also prevent STIs and HIV.

There are also important lessons for PrEP that can be derived from the contraception mix. The contraception method mix describes the contraceptive use distribution among the contraceptive users (78). The injectable progestins depot-medroxyprogesterone acetate (DMPA) and norethisterone enanthate (NET-EN) are the most widely used contraceptive methods in South Africa and throughout SSA (79,80). According to the 2016 National Demographic Health Survey (DHS), 25% of sexually active women use injectable contraceptives (81). The contraceptive mix provides insight into both demand and supply factors, as its skewness toward one method could indicate limited access to other methods; hence, it is essential to understand the factors that influence choices to increase contraceptive prevalence (82). South Africa has a generally high contraceptive prevalence rate (CPR) of 64.6% (15-49 years), which aligns closely with the global CPR of 65% in 2022 (77,83). It also has a high CPR among AGYW—60.4% (15-19 years) and 61.3% (20-24 years) (83). South Africa's high CPR masks underlying challenges in service delivery and access, which ultimately affect the consistent and continued use of methods (84). Discontinuation of injectable contraceptive methods and their failure have also been reported (85). It is important to understand the reasons for injectable contraceptive discontinuation and failure and then use that information to avoid long-acting PrEP methods from falling into the same pitfalls.

There are also common barriers to contraceptive use experienced by young women using either contraception or HIV prevention methods. A common challenge cited in studies, such as the Tablets, Ring, Injections as Options (TRIO) study (86), is male partners' interpretation of women's use of these prevention measures as either promiscuity or lack of faithfulness in relationships or HIV status (66). In another study conducted in Kenya, male partners were often viewed by young women as barriers rather than supporters of PrEP use (87). As new

HIV prevention agents such as DVR, LEN, and CAB-LA are not yet available outside study settings, this PhD explores young women's contraceptive experiences to identify lessons that can guide the design and delivery of long-acting PrEP services.

Several lessons have been drawn from contraception and applied to PrEP for HIV prevention. Some of the lessons include the observation that new technologies alone will not expand choices—service providers and service delivery systems are equally important—and that failure to account for user preferences can undermine the potential for new products (88). Also, low continuation rates, difficulty in ensuring access to the most vulnerable groups, and challenges with the timing of initiation have reduced the impact of long-acting reversible contraceptives (LARC) (89). In addition, the rollout of LARC demonstrated how a narrow focus on method effectiveness presented opportunities to coerce, discriminate, and silence individual preferences and goals (90). It is against this background that the qualitative formative phase of this study explores young people's use of contraceptive methods, eliciting their preferences for service delivery of new long-acting PrEP formulations.

1.2 Justification

Globally, AGYW continue to be disproportionately affected by HIV, with South Africa being the epicentre of the epidemic. Oral PrEP is now available for all people at substantial risk of HIV infection. However, taking a daily pill has been reported to be a burden, and studies have shown that young people generally prefer long-acting HIV PrEP technologies (91–93). There is, however, still a dearth of information on the best ways to deliver these services. This study is important as it will inform the delivery of long-acting PrEP.

Previous studies have looked mostly at product-related attributes of injectable PrEP technologies, such as where the injection should be administered and how frequently. Few studies have focused on how long-acting PrEP technologies should be delivered with greater attention given to modifiable product characteristics (63,91). There has been limited focus on service delivery. The World Health Organisation (WHO), through its four pillars of the Differentiated Service Delivery Model (DSD) for HIV prevention and treatment (94), emphasises the need to answer critical questions: ***who*** provides long-acting PrEP, ***where*** and

how it should be provided, and ***what*** other services can be offered. It is crucial to generate evidence on how services should be delivered to young women.

The DCE from this PhD study focuses on long-acting injectable PrEP only, as most students selected this technology in the qualitative formative stage. While AGYW are the most affected group, few studies have elicited their preferences, especially regarding the delivery of long-acting injectables. Young women in tertiary institutions have unique needs due to their busy schedules, which calls for tailoring services that enable not only access to HIV prevention services but also sustained use of services. Students are also a mobile population, often changing provinces of residence during semester breaks, this study informs how to serve such groups. It is important to identify and overcome potential barriers to the utilisation of HIV prevention services among young women to ensure continued use.

1.3 Research Question, Aim, and Research Objectives

The research question this PhD addresses is: What are female students' perceptions of new long-acting PrEP methods, and what are their preferences for service delivery? The sub-questions are as follows:

- What are their experiences with HIV prevention and contraceptive methods?
- What are the attributes of service delivery that young women prefer or are willing to trade off?

Aim

To explore female students' (18-24 years) perceptions of new long-acting methods of PrEP and their preferences for service delivery in tertiary institutions in Gauteng province, South Africa, drawing lessons from contraceptive use and services.

Objectives

1. To explore the barriers and enablers of the use and delivery of current contraceptive offerings among young women in tertiary institutions in Gauteng province, to inform the delivery of long-acting PrEP formulations.

2. To explore young women's preferences and willingness to use new PrEP technologies – the DVR and long-acting injectable – at two tertiary institutions.
3. To identify and determine service delivery characteristics that are most important in encouraging young women in tertiary education to take up long-acting PrEP.

1.4 Structure of the thesis

This thesis has eight chapters. The first chapter introduces the study and provides its aim and objectives. This is followed by the literature review chapter (Chapter 2), which provides a critical review of literature at global, regional, and local levels. The concepts relevant to this study are defined, and the conceptual framework is presented. Chapter 3 covers the research methods and design used in the study to answer research questions, and also presents a justification for using such methods. Chapters 4 to 6 present the research findings in the form of published papers, formatted according to the requirements of the journals where they were published. In the thesis, the three papers are referred to as Chapters 4, 5, and 6. They are not presented in order of publication but are organised to enable a coherent understanding and interpretation of the overall study. Chapter 7 discusses the findings of the three papers. Chapter 8 presents the study recommendations and the conclusion of the thesis. The final chapter also provides policy guidance and future directions.

Chapter 2: LITERATURE REVIEW

2.1 Introduction

The chapter examines HIV prevention and reviews evidence to understand university students' preferences for service delivery, as well as the facilitators and barriers to the use of current contraceptive offerings, in order to inform the delivery of new long-acting PrEP formulations. Topics relevant to the identified gaps, such as service delivery models, are discussed. This is followed by a discussion of key concepts, including service delivery models, acceptability, access, and adherence, which are defined and explained before the conceptual framework is presented. The socio-ecological model (SEM) is used to explain linkages and relationships between the various concepts and factors. These factors, presented in the literature review, are categorised into individual, household, health system, and community levels. A DCE is the main method used to answer the study's research questions. The justification for using DCEs to assess the students' preferences for service delivery models of long-acting PrEP formulations is provided, along with an assessment of the advantages and limitations of the method. Finally, the chapter concludes with a brief summary.

2.2 HIV Prevention

New HIV infections remain high in South Africa despite the existence of many HIV prevention interventions. The country's HIV prevention strategies include male and female condom distribution, HIV treatment as prevention (TasP), voluntary medical male circumcision, management of sexually transmitted infections (STIs), PrEP, and post-exposure prophylaxis (PEP). Abstinence is also recognized as an approach to reduce new HIV infections (95,96). While all these methods are effective in preventing HIV, each has advantages and disadvantages, highlighting the need to provide a range of options.

2.2.1 Condoms

Condoms are effective in preventing HIV (97). They also protect young women from getting STIs and unintended pregnancies. The female condom (FC) is the only commonly available method that gives women and girls direct control over protection from STIs and unplanned

pregnancies, yet it accounts for only 1.6% of the total global condom distribution (98). In South Africa, male condoms are freely provided through the public sector (99). Several studies have focused on both male and female condom use.

As condom use is a behavioural intervention, several challenges have been reported. Effective and consistent condom use is influenced by alcohol use, gender inequalities, and young men's perception of condomless sex as a sign of masculinity and power (100). While female condoms have been described as an empowerment tool for women (101), especially in countries such as South Africa, where HIV is primarily transmitted heterosexually (102), they face challenges. Reported barriers include partner negotiation and difficulty with insertion. In addition, cultural norms that discourage touching genitals often result in hesitancy to try out methods requiring vaginal insertion (98,103). Studies have shown how alcohol use, gender imbalances, and financial dependence on male partners undermine young women's ability to negotiate condom use (15,16). A study conducted in South Africa reported that male partners were not willing to use condoms when they were aware that their female partners were using contraception (104). However, contraception only prevents unintended pregnancies and does not prevent HIV, the absence of condom use therefore exposes the sexual partners to HIV infection. Correct and consistent condom use remains a major challenge, especially among young women in longer-term relationships (99), where trust and perception of commitment often act as barriers (105).

While condoms remain an essential component of the HIV prevention toolbox, their correct and consistent use continues to be undermined by multiple factors. Between 2014-2022, studies report a 6% decline in condom use among adolescent girls and a 9% decline among adolescent boys across countries in Europe, Central Asia, and Canada (106). A review highlighted that women frequently struggle to negotiate condom use with their male partners (107) due to gender inequalities and male control (100). A year before the 2016 DHS, only 65% of men with more than one sexual partner used a condom during their last sexual intercourse (108). In a study conducted among TVET college students in Limpopo province, South Africa, 87% reported condom use at sexual debut, compared to 60% at most recent sexual intercourse. These findings are consistent with another study among sexually active young people, in which only 59% reported condom use at last sex and just 45% reported

consistent condom use (109). Such findings reflect the persistent difficulties women face in negotiating condom use and underscore the need for HIV prevention methods that women can control, such as discreet PrEP options like CAB-LA, DVR, or LEN.

2.2.2 Medical male circumcision

VMMC aims to reduce men's risk of acquiring HIV infection during heterosexual exposure (110). In a clinical trial conducted in South Africa, a 60% reduction in female-to-male HIV infection was reported among circumcised men compared to those uncircumcised (111). The WHO and Joint United Nations Programme on HIV/AIDS (UNAIDS) recommended VMMC for countries with generalised epidemics, such as South Africa, although it offers only partial protection against HIV (112).

The WHO target of achieving VMMC coverage for 80% of men has not yet been met. In the 14 priority countries outlined in the WHO framework for 2012-2016, nearly 60% of the target had been achieved by the end of 2015 (113). In South Africa, circumcision rates vary between 35-43%, with some ethnic groups, such as the amaXhosa, practicing male circumcision as a cultural rite of passage from boyhood to manhood (114,115).

While overall, VMMC was considered to be a success in countries such as Kenya, significant barriers remain. Older men often refuse circumcision due to concerns about abstaining from sex and taking time off work during recovery (116–118). In other settings, additional barriers include cultural and religious opposition, fear of complications, and persistent misconceptions (119–121).

2.2.3 Treatment as prevention

Treatment as prevention (TasP) is an essential component of the HIV prevention toolkit. It involves treating HIV with ARVs, a proven strategy to prevent new infections. ARVs reduce HIV-1 concentrations in genital secretions, thereby lowering the risk of transmission from a partner living with HIV to a partner not living with HIV (122,123).

In the HIV Prevention Trials Network (HPTN) 052 study, early initiation of antiretroviral therapy (ART) was linked to a 93% reduction in the sexual transmission risk to uninfected partners (124). A later study reported no transmissions among serodiscordant heterosexual couples and virally suppressed MSM engaged in condomless sex (125).

Evidence gathered from clinical trials and cohort studies has led countries such as South Africa to expand ART programmes. South Africa now has the largest ART programme in the world, with an estimated 5 million people [15-49 years] on ART out of an estimated 8 million PLHIV, leaving more than 2 million people untreated (126). This gap remains substantial. Under the UNAIDS 95-95-95 testing and treatment targets, in 2022, 76% of PLHIV were accessing treatment, with 71% virally suppressed (5). Only five countries—Zimbabwe, Botswana, Eswatini, Rwanda, and Tanzania—had achieved the targets by 2022 (5). South Africa is still lagging behind.

Therefore, additional HIV prevention options, such as PrEP are critical, as TasP depends on the ART initiation and adherence of partners living with HIV. Men generally have higher attrition rates from ART programmes and are less likely to test for HIV, with about 45% of men tested in 2016 compared to 59% of women. Moreover, men are less likely to link to care and initiate treatment compared to women (108,127). According to a South African Human Sciences Research Council survey, among younger adults (15-24 years), women had higher levels of viral suppression (83%) compared to men (79%), while young men (25-34 years) had the lowest suppression rate (66%) (128).

HIV viral load (VL) suppression, defined as <1000 copies HIV RNA/mL, is a measure of ART efficiency and a proxy for both treatment adherence and HIV transmission (109). Low rates of viral suppression, particularly among young men, indicate that women need HIV methods under their own control rather than relying on male partners who may not be on treatment or virally suppressed. Challenges to achieving viral suppression among PLHIV include missing medical appointments and suboptimal treatment doses (129).

2.2.4 Post-Exposure Prophylaxis

Post-exposure prophylaxis (PEP) is a key tool in South Africa's HIV prevention toolkit. PEP must be initiated within 72 hours of potential exposure to HIV-infected body fluids and continued for 28 days to prevent HIV infection. Initially, PEP was mainly used to prevent occupational exposure but is now also recommended for sexual exposures (130).

Although PEP is the only available intervention for adults after HIV exposure, it remains largely underutilised in low and middle-income countries (131). PEP complements PrEP within the HIV prevention toolkit, as sexual exposures are often unplanned and anticipated (132). However, in SSA, PEP has not been routinely integrated beyond occupational exposures, including for groups such as FSWs and MSM (132).

A systematic review of the efficacy of PEP in non-human primate studies reported an 89% risk reduction in seroconversion among animals treated with PEP (133). PEP has therefore become an accepted intervention for individuals with recent HIV exposure, e no human data exists from the randomised control trials (RCTs) (134). Evidence from a case-control study among healthcare workers demonstrated a more than 80% reduction in HIV acquisition risk among those who used PEP (135).

Despite its benefits, PEP faces significant challenges. It is often poorly tolerated, with about one-third of users defaulting or failing to complete the course, and adverse effects are reported by half of users (7). PEP is also less effective if not initiated within 72 hours of exposure and efficacy can be compromised by drug interactions (7). Furthermore, PEP access remains a challenge; awareness and use among young women and other high-risk populations remains low (136). For example, sexual assault is rife in South Africa, yet very few survivors access PEP, despite non-consensual sex posing a substantial risk of HIV infection (7). Therefore, expanding prevention options, including PEP and PrEP, are needed.

2.2.5 HIV Pre-Exposure Prophylaxis

2.2.5.1 Oral PrEP

HIV PrEP provides young women with greater control over HIV prevention. By contrast, male condom use and VMMC are male-controlled methods, limiting AGYW autonomy in HIV prevention and underscoring the need for PrEP. As part of its HIV prevention strategy, South Africa started rolling out oral PrEP in 2016 using a phased approach, starting with female sex workers. South Africa was among the first countries in SSA to roll out PrEP. Globally, by the end of 2023, an estimated 6.2 million oral PrEP initiations had been recorded (18). By the end of the first quarter of 2024, this number had risen to 6.7 million, with South Africa accounting for approximately 1.3 million initiations (137). By the last quarter of 2024, global PrEP initiations reached 8,012,989 (137), with South Africa contributing about 16% of the total.

PrEP service delivery settings are expanding across the globe. Different countries have varying differentiated service delivery models for PrEP, with some countries, like Zambia, offering only one platform (prisons), while others, such as Vietnam, have up to eight platforms: mobile clinics, non-governmental organisations (NGOs), at-home services, family planning (FP) clinics, community-based distribution, HIV clinics, pharmacies, and general health clinics (137).

In South Africa, oral PrEP is currently available through 93% of all primary health clinics, as well as via community-based delivery, including mobile clinics, select private clinics, and pharmacies (137). The number of PrEP users more than doubled between 2021 and 2023, and by the end of May 2023, PrEP was freely available at over 3,700 facilities nationwide (138).

2.2.5.2 The long-acting PrEP

The Dapivirine Vaginal Ring

The DVR, approved in South Africa but not yet widely available, is made of silicone and slowly releases the ARV dapivirine. It is the first woman-centred, long-acting HIV prevention method. Dapivirine is a non-nucleoside reverse transcriptase inhibitor (NNRTI) (139). In the ASPIRE study, the DVR reduced HIV infection risk by 27% overall and by 56% in women older than 21 years (140). In the Ring study, it reduced HIV incidence by 31% overall and by 37% among

women older than 21 years (140). In open-label studies, with consistent use, modelling suggested that DVR reduced chances of HIV acquisition by 50% or more (141,142).

In July 2020, the DVR received a positive scientific opinion from the European Medicines Agency (EMA) for use in women aged 18 and older in developing countries (143). This shifted the DVR from being only a research product to a near-market product (143). In November 2020, DVR received WHO prequalification for HIV, signifying that it met global standards for safety, quality, and efficacy in reducing women's risk of infection. In March 2022, the DVR was approved by the South African Health Products Regulatory Authority (SAHPRA) for use among non-pregnant women over 18 years of age (144).

With its discreet use, DVR holds great promise for young women to control HIV prevention, especially in South Africa, where women face high levels of physical and sexual violence that limit their ability to negotiate condom use (145). The DVR also has an advantage over oral PrEP by avoiding gastrointestinal absorption, which minimises systemic exposure, resulting in fewer side effects (146,147). The DVR is now licensed for use in 11 countries and is being tested in several additional studies. It has been approved in South Africa, Kenya, Uganda, Zambia, Rwanda, Malawi, Botswana, Namibia, Eswatini, Lesotho, and Zimbabwe (139). Globally, by the last quarter of 2024, more than 5,000 DVR initiations were recorded, with South Africa contributing nearly 80% of the total initiations (137).

Studies consistently report that the DVR is acceptable among women in different age groups. Several acceptability and feasibility studies have been conducted globally (148–152). In Zimbabwe, a demonstration project assessing the feasibility and acceptability of DVR as an alternative to oral PrEP found that higher continuation rates among DVR users (64%) compared to oral PrEP users (59%) at month four (153). A three-month DVR is currently under investigation and the results from a phase 1 open-label, randomized, crossover relative bioavailability trial (IPM 054) showed superior drug release compared to the monthly DVR (154).

Long-acting Cabotegravir

CAB-LA's high efficacy has been demonstrated in multiple clinical trials. It is a bi-monthly, intramuscularly administered ARV for people not living with HIV. CAB-LA is an integrase strand transfer inhibitor (INSTI) (155). Two global RCTs (HPTN 083 and 084) were double-blinded studies that evaluated the safety and efficacy of CAB-LA compared to oral PrEP. HPTN 083 enrolled 4,570 transgender women (TGW) who have sex with men and cisgender MSM in Vietnam, Brazil, Argentina, Peru, Thailand, and South Africa. It was the first study compare CAB-LA directly with Oral PrEP (156). The HPTN 084 study enrolled 3,224 women (18-45 years) across SSA (157) - Zimbabwe, Botswana, Kenya, Uganda, Eswatini, Malawi, and South Africa.

In HPTN 084, CAB-LA was shown to be superior to oral PrEP, with nine times fewer HIV infections compared to oral PrEP users (130). In HPTN 083, CAB-LA reduced infections by seven-fold compared to oral PrEP (156). Although CAB-LA is highly effective, drug levels decline gradually upon discontinuation, leaving what is described as a pharmacologic “tail”. This tail period carries a vulnerability to drug resistance if users acquire HIV while cabotegravir remains at sub therapeutic levels (158,159).

In the HPTN 077 trial, a phase 2 study that examined the CAB-LA terminal pharmacokinetics and safety, about 40% of women and 10% of men still had detectable drug levels 76 weeks after the last injection (158). To mitigate this risk, individuals discontinuing CAB-LA can transition to oral PrEP for approximately one year to cover this tail period and reduce the risk of acquiring cabotegravir resistant-HIV (160).

CAB-LA is currently being studied in several demonstration projects and has been approved in more than 50 countries (155). By the first quarter of 2024, there were more than 12,075 global CAB-LA initiations, with the United States contributing over 90% of the total (n=11 000), followed by Zambia (n=822), South Africa (n=193), and Brazil (n=20) (137). By the last quarter of 2024, there was a sharp rise in CAB-LA initiations in South Africa, with the country contributing one-quarter of the estimated 28,000 new global initiations (137).

While CAB-LA and other long acting interventions are promising, their success in real-world settings depends on their feasibility and acceptability (39). Aligning services with user

preferences is critical, as it can influence uptake, support long-term engagement, and ultimately reduce HIV incidence (161).

Lenacapavir

Another long-acting injectable formulation is lenacapavir (LEN), which is administered every six months and is in currently in phase III clinical trials (162). In December 2024, Gilead submitted an application to the United States Food and Drug Administration (FDA) for LEN's approval for use in HIV prevention, and a priority review was granted (163). LEN is an HIV-1 capsid inhibitor, bi-annually administered, antiretroviral drug currently being investigated as a potential PrEP product (164). Unlike CAB-LA, which is administered intra-muscularly, LEN is a subcutaneous injection.

Purpose 1 of the clinical trials completed enrolment of AGYW in South Africa and Uganda, with interim results now available. This trial evaluated the safety and efficacy of LEN compared to emtricitabine/tenofovir alafenamide (F/TAF), which was approved by the US FDA for people assigned male at birth (165). None of the participants who received LEN acquired HIV (166).

Purpose 2 has the same purpose but is being conducted in South Africa, Mexico, United States, Thailand, Peru, Brazil, and Argentina. It enrolled cisgender men, transgender women, transgender men, and gender non-binary individuals who have sex with partners assigned male at birth. Results indicated a 96% reduction in HIV acquisition risk, with almost 100% (99.9%) of LEN users remaining HIV-free (164).

Islatravir

Islatravir is a novel, promising nucleoside reverse transcriptase inhibitor investigational drug with potential for both HIV treatment and prevention (167,168). For HIV prevention, it is a long-acting PrEP formulation, administered either as a monthly pill or as a subcutaneous polymer implant for both women and men, and is projected to provide protection for at least one year (168,169). However, Merck discontinued the development of the monthly oral formulation of Islatravir, while other long-acting PrEP formulations continue to be evaluated. (24).

Dual Prevention Pill

The dual prevention pill (DPP) was developed in response to the dual burden of HIV and unintended pregnancies faced by women in SSA. DPP is one of several multipurpose prevention technologies (MPTs) in the pipeline. It co-formulates combined oral contraception (ethinyl estradiol and levonorgestrel, or EE/LNG) with HIV oral PrEP (tenofovir disoproxil fumarate and emtricitabine, or TDF/FTC) into a single pill (170).

As both PrEP uptake among young women in SSA and contraceptive prevalence rate remain low (171), the DPP could address these challenges and potentially encourage greater PrEP uptake. Studies have identified multiple facilitators and barriers to the uptake of both contraception and oral PrEP (34,172). By combining these products, the DPP may help overcome some of these challenges. Moreover, expanding prevention options can better align with user preferences and meet diverse needs (171).

Although DPP prevents both HIV and unintended pregnancy, it remains a daily pill, and the burden of daily adherence could limit its acceptability. This highlights the continued need to expand prevention choices by offering long-acting alternatives such as CAB-LA, DVR, and LEN.

2.3 Service Providers' Role in PrEP Delivery

2.3.1 Service Provider Attitudes

Health care providers play a crucial role in the provision of SRH services, especially among young people. They are also well-placed to address the unique needs of young women (173). Provider characteristics are one of the key domains of a youth-friendly health care system. Yet, access and utilisation of health services remain a challenge despite global agreements on adolescent SRH and rights (174).

Young people's access to health care is often influenced by gate-keeping systems (175). For example, nurses and other providers have been identified as "gatekeepers" for PrEP access (176). Young women, especially those in tertiary institutions, struggle to access SRH services,

including contraception (172,177). Negative provider attitudes are a significant deterrent to using the services (34).

This challenge is not unique to young women's SRH services. Other interventions, such as VMMC, have faced similar challenges. Providers of VMMC services have also been described as gatekeepers, especially when providing oral PrEP (176). One of the most cited structural barriers to the provision of oral PrEP delivery in African countries is negative health provider attitudes towards its provision, especially towards offering services to young women (34,178–181).

2.3.2 Provider training and skills

Provider training plays a crucial role in delivering services to AGYW. Inadequate provider knowledge about PrEP has been cited as a key barrier to PrEP uptake and utilisation (174,181,182). Prior to PrEP rollout, a study among nursing and pharmacy students in Kwa-Zulu Natal, South Africa, assessed their knowledge, perceptions, and attitudes towards VMMC. The study reported a mean knowledge score of 66.4 % and a relatively positive attitude of about 63%, with the majority (85.4%) feeling that promoting VMMC was appropriate (183).

The success of public health interventions often depends on provider buy-in. Providers are influential in mobilising clients and introducing new interventions, as seen with VMMC. However, a systematic review of provider barriers to PrEP reported that many lacked adequate knowledge, which made them uncomfortable with prescribing it (182). Negative provider attitudes, particularly towards young people under 18 years, further limit PrEP use (181). In a study conducted in South Africa among MSM and FSW, participants reported not using PrEP because the providers did not offer it to them (13).

There is an urgent need to strengthen provider training to address these barriers. Training should include modules on youth-friendly services, such as the creation of youth zones – dedicated points of service delivery for young people. To increase PrEP uptake, providers must also be willing to prescribe it and yet, in some studies, providers demonstrated limited

intention to do so (184). Equipping providers with sufficient knowledge through training is therefore crucial when offering new HIV prevention interventions.

In addition, provider training should address personal biases and beliefs about young people's sexual activity. If left unaddressed, such biases can negatively impact client care (185). Provider bias remains a significant barrier to PrEP provision, highlighting the need for targeted interventions such as training to address barriers and ensure optimal service delivery (186).

2.4 Concepts and Conceptual Framework

2.4.1 Concepts used in the thesis

The success of the scale-up of long-acting PrEP technologies depends on a clear understanding of the relevant concepts and their interrelationships. While previous HIV prevention studies have primarily focused on oral PrEP, this thesis concentrates on long-acting methods, specifically the DVR, CAB-LA, and LEN, which are at different stages of development and implementation. This novel approach requires examining students' preferences for service delivery.

In this section, we will review the following concepts: Service delivery models, acceptability, access, and adherence.

2.4.1.1 Service delivery models

The acceptability of new health technologies cannot be understood outside service delivery models. How products are delivered influences their uptake. Standard definitions of a PrEP service delivery model are, however, still lacking (187). PrEP is not delivered as a stand-alone programme but as part of comprehensive combination prevention (188). One contraceptive study referred to a service delivery model as a "service delivery system", describing it as the way in which a product is provided to potential users (27). Since the PrEP field borrows a lot from contraception, previous studies on the latter have described how attributes of a health delivery system can influence women's decision-making, thus influencing their choices or preferences. From a feminist perspective, the choice of contraceptives is a complex interplay between the product, the woman, and the service delivery system (39). Attributes identified

by the feminist theorists, which can also be applied to HIV prevention with long-acting PrEP methods, include the attitudes and behaviour of health providers, the availability of a variety of methods, and the physical attributes of the delivery site, among other factors (39).

A scoping review identified four components of an oral PrEP service delivery model that are relevant to this study, as it focuses on long-acting PrEP methods: the priority population, the setting for delivering PrEP, the service delivery professionalisation, and the delivery channels (187).

2.4.1.2 Priority population

Identifying the relevant population for PrEP services is a key component of any service delivery model (189). A scoping review on PrEP service delivery models for HIV prevention reported that people at high risk were the main recipients in most studies, while others focused on certain priority populations such as MSM (190). There were also key population-specific models, most of them focusing on MSM, sometimes combined with transgender women (37,187). In addition, some models targeted female sex workers, serodiscordant couples, and/or young people (187).

2.4.1.3 Delivery setting

The setting for service delivery refers to the place where the services are provided. The categories for oral PrEP delivery models are mainly clinic/hospital-based, community, or home-based (190–194). Within clinic/hospital-based models, specialised services include STI, reproductive health services, and study centres (187). However, there have been increasing calls to move beyond clinic-based delivery and explore other avenues such as pharmacies and community-based centres (195).

Access challenges include regular clinic attendance, time off work or school, and travel time associated with clinic-based PrEP programmes. Mobile and campus clinics can mitigate these barriers by bringing services directly to students, though non-students or students during their vacations may still need alternative, non-clinic-based services. Legal restrictions regarding PrEP prescription also pose barriers (195). For instance, the South African Pharmacy

Council (SAPC) published legislation enabling pharmacists to prescribe and dispense ARVs, including PrEP, without a doctor's prescription. This policy is, however, being legally challenged by the Independent Practitioners Association (196). Adolescents aged 12 and above can self-consent for PrEP if they have the capacity to understand its benefits, risks, and implications (196). Yet, some legal minors lack sufficient cognitive maturity to make such decisions. In contrast, countries such as Uganda require parental/guardian consent for individuals under 18 years, creating inconsistencies with self-consent frameworks (197).

2.4.1.4 Health service providers

Health service providers are a key component of any service delivery model. Since PrEP is a bio-behavioural intervention, their role in implementing it in clinical care settings is crucial (198). Oral PrEP service models typically involve either clinical care and community-based delivery (199). A scoping review highlighted that health service providers who provided oral PrEP services to clients in different studies were clinicians or specialist physicians. In one-third of the studies (n=10), nurses led PrEP services, with physicians attending primarily to complex cases (187,200). In Kenya, pharmacists also played an important role in identifying potential PrEP users (201).

While these studies reported on the type of cadres who provided PrEP services in different settings, little is still known about which providers the students may prefer for DVR and other new long-acting PrEP technologies, which differ significantly from oral PrEP. Peers and community health workers have been shown to play a crucial role in decentralised PrEP delivery, particularly among AGYS, where they have been effective in supporting uptake (202,203).

2.4.1.5 Delivery channels

The practical modalities of delivering long-acting PrEP technologies have not yet been sufficiently investigated. Delivery channels refer to the platforms or mechanisms through which PrEP formulations are provided. Oral PrEP has traditionally been delivered through face-to-face interactions in a physical setting (187). However, new models are emerging that

incorporate digital and self-management approaches, including telemedicine, m-Health, and other forms of remote care (187,204).

Digital innovations continue to play an increasing role in supporting PrEP use, offering reminders to take medication, providing information and education, fostering support groups, and assisting with adherence through digital applications, text messages, emails, the internet or phone (204–206). For AGYW, a digital, mobile optimised HIV Prevention journey tool, was developed to help them explore methods that align with their personal preferences, needs, and lifestyles, while also supporting providers in offering informed, client responsive counselling (207).

2.4.1.6 Access

Access to health care services is a fundamental human right and a key element of human development (208). There has been growing recognition of the concept of access in health policy literature (209), largely driven by the increasing importance of health service delivery and the need to measure health service utilisation (209). The concept of access is complex and has been described in various ways by different scholars (210).

Mooney describes access as a function of both demand- and supply-factors (211). Demand factors include knowledge, attitudes, and self-care, while supply factors include the location, cost, and availability of the health service (209). Levesque argues that accessibility is personified in clients and is influenced by an individual's perception of how accessible the health care system is (209). For the purposes of this study, access is defined as the ability to approach a health facility and receive health care that satisfies the client's needs. Access has different components, as described in various studies.

Closely linked to access is the concept of acceptability. Acceptability has been described as an interaction between characteristics of persons, households, communities, health systems, and organisations (212). From an ecological perspective, it reflects the interdependence and interactions within and across different levels of health systems and society (213).

Scholars have identified different components of acceptability. Levesque et al. identified five components of accessibility: approachability, affordability, acceptability, availability and accommodation, and appropriateness (209). These components correspond to the clients' ability to perceive, seek, reach, pay, and engage with services (209). Levesque built on Penchasky's four components of health access: availability, accommodation, acceptability, and affordability (212).

Building on these, Lau's conceptual framework of healthcare accessibility for PrEP delivery, adapted from Levesque, identified various barriers to PrEP implementation corresponding to the five constructs of acceptability. For instance, lack of PrEP awareness - a barrier to approachability of the health system - may be dealt with by promoting community awareness of PrEP, such as through technology-based community outreach (214). Similarly, stigma related barriers to acceptability may be mitigated by creating trusted spaces or introducing online referral systems (214).

This study will use an ecological framework to examine the barriers to the implementation of new long-acting PrEP technologies, recognizing that the barriers may originate from various and interconnected sources.

2.4.1.7 Acceptability of long-acting PrEP formulations

Acceptability is a multi-dimensional concept and is considered one of the components of accessibility (209). It is a multifaceted and complex concept (73,146,215), defined as:

> "*A multi-faceted construct that reflects the extent to which people delivering or receiving a healthcare intervention consider it to be appropriate, based on anticipated or experienced cognitive and emotional responses to the intervention" [* (39)*: p7].*

This is only one of the many definitions offered by different scholars. Other definitions highlight aspects such as attitudes, tolerances, and preferences (either revealed or stated) (146). A systematic review by Sekhon et. al. provided a broader view of acceptability by grouping these elements into a framework that includes effective attitude, burden of use, ethicality, intervention coherence, opportunity costs, perceived effectiveness, and self-efficacy (146).

The concept of acceptability has evolved over the years. Interest in PrEP acceptability research has been growing steadily, drawing on lessons from contraceptive studies, where acceptability expanded significantly in the 1970s (216). Traditionally, acceptability has been understood as method continuation, but Ellias and Coggins expanded this to include knowledge of potential benefits, awareness of alternative products, and service delivery channels (27). Heise further argues that acceptability is relative, conditional, and user-driven, and should not be viewed as a static feature ingrained in a product or intervention that can be easily adjusted if lacking (68). The acceptability of contraception, and by extension PrEP, therefore represents a complex interplay between users, technology, service delivery characteristics, and the social environment (216).

This study adopts a social-ecological framework to analyse acceptability in HIV prevention, as it incorporates both individual and contextual factors. Young women's preferences for new HIV prevention methods are influenced by these different factors.

The social ecological model highlights individual, partner, community, and socio-cultural factors. Some scholars have described it as the willingness to either try or use a product, which may also imply likeability (69). However, caution should be taken in equating acceptability with likeability, as it may simply mean the product is the “least disliked” (215). There is no consensus on a single definition or conceptualisation of acceptability in the literature (146). What does stand out, however, is the attempt to understand what current or potential users want in a product or service (69).

This study examines three aspects of acceptability: (1) students’ perceptions as potential PrEP users; (2) facilitators and barriers to PrEP use; and (3) preferences for service delivery channels. Together, these dimensions will inform the hypothetical acceptability of the service delivery characteristics. These three aspects of acceptability were chosen as they align closely with the study focus. Because this study addresses new HIV PrEP technologies, understanding of young people’s perceptions, identifying the facilitators and barriers to their use, and identifying their preferences is crucial in effective delivery of the services.

2.4.1.8 Adherence

Adherence plays a crucial role in determining drug effectiveness. It refers to taking medication exactly as prescribed. In the PrEP literature, factors that promote use are often described as promoting adherence. The use of the term has evolved over the years. Initially, it was applied primarily in the context of treatment, but with the development of prevention focused interventions such as PrEP, there have been calls for alternative terms such as "effective-use", “continued use”, or “prevention-effective use” (217). This shift reflects that, while strict adherence is necessary for treatment to achieve viral suppression, PrEP can be used more flexibly, according to one’s prevention needs.

The relationship between acceptability and adherence in both clinical trials and real-world settings has not been fully understood (37,38). A qualitative study with former ASPIRE trial participants for the DVR highlighted that the relationship is not straightforward, as some users may use the ring without liking it, while other liked it but did not use it consistently (68).

2.5 Conceptual Framework

The Socio-Ecological Model (SEM) in Figure 2.1 depicts the multi-level factors that may influence a young women's access to preventative health services and, ultimately, their preferences for delivery of new long-acting PrEP technologies. The model also underscores how these factors shape the acceptability of health services, through improved access, increased uptake, and sustained use of these new methods. Collectively, these pathways ultimately lead to a reduction in HIV incidence.

2.5.1 Socio-ecological Model applied to PrEP use

The SEM was used to understand the different spheres of influence that may affect young women’s use of PrEP, as well as their preferences for how services for long-acting PrEP formulations should be delivered. As shown in Figure 2.1, the determinants of PrEP use are grouped into individual, household, organisational, community, and policy factors (218). A systematic review of studies conducted among MSM in LMICs highlighted that willingness to use oral PrEP was higher when challenges across these levels were addressed (32). Similarly, identifying potential facilitators and barriers young women face at these levels can inform

strategies to support and motivate the uptake of new long-acting PrEP technologies. Understanding these factors is therefore critical to the successful rollout of long-acting PrEP for university students. This PhD study explored the multi-level factors that influence young women's use of the new long-acting PrEP technologies, including their choices for service delivery. The SEM was also used to guide the qualitative analysis by explaining the linkages and relationships between the various factors.

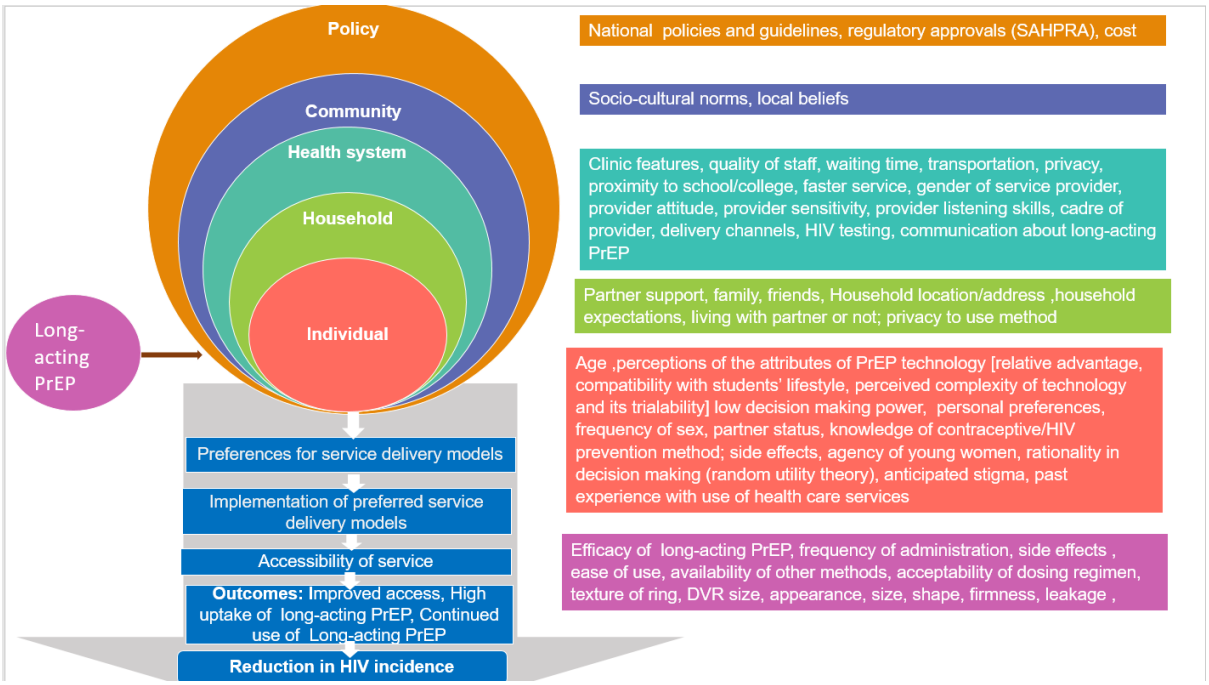

Figure 2.1: An adapted socio-ecological framework for factors influencing use of Long-acting PrEP (McLeroy et al 1988) (219)

2.5.1.1 Individual Factors

Some of the identified facilitators and barriers to oral PrEP uptake at the individual level are also relevant for new long-acting PrEP technologies. Important lessons from oral PrEP can therefore be applied to guide the implementation of these new long-acting PrEP technologies. As shown in Figure 2.1, at the individual level, barriers and facilitators to PrEP uptake include knowledge/awareness of PrEP, fear of side effects (real and perceived), age, and education, among other factors (13,220–223). Limited decision-making power and logistics of daily life, such being busy, forgetting to take PrEP, pill fatigue (131), are potential barriers (223). In addition, anticipated stigma influences the decision to take up PrEP (224). The use of decision-making tools, including various mHealth platforms which support PrEP uptake either by

reminding young women to take PrEP or answering their questions has been shown to facilitate PrEP use (225,226).

A low perception of HIV risk, including doubts or distrust in PrEP's effectiveness, have been identified as the barriers to PrEP uptake (220,227,228). Low HIV testing rates in South Africa, including young people's attitudes and behaviour toward testing, are further barriers to PrEP uptake (229). Addressing these barriers while leveraging facilitators is essential for improving both current and future PrEP uptake (220). Facilitators include individual motivation for good health, while demographic factors such as age and education influenced willingness to use PrEP (228). Understanding the barriers and facilitators to oral PrEP use will inform the rollout of new long-acting PrEP technologies, ensuring that efficient and effective implementation.

2.5.1.2 Household Factors

Significant others have a strong influence on young women's decisions to access health care services for non-emergency care, including the timing of clinic visits (230). Evidence from the VOICE clinical trial showed that friends, family members, and male partners positively and negatively influenced the use of the ring (231). Studies conducted in different countries demonstrated that the acceptability of the ring is influenced not only by product efficacy, safety or ease of use, but also by male partners also attitudes and support (69). When partners supported continued ring use, women maintained use, whereas opposition often led to early ring removal (31). Similarly, in the TRIO study conducted in South Africa, women described interpersonal challenges associated with both contraceptive and HIV prevention methods, as male partners influenced their use of these methods (232). Male partners were reported to link the use of contraception or HIV prevention methods with either promiscuity or females' distrust of their male partners, creating barriers to uptake. There is, therefore, a need to identify service delivery attributes that can overcome these barriers and support women's use of new long-acting PrEP technologies, including DVR, CAB-LA and LEN.

Male partners' decisions, however, do not always influence women's decisions to use either HIV prevention methods or contraceptive methods. This brings in the concept of women's agency in making reproductive health decisions. Agency assumes that women not only set goals but also take actions to meet these goals (233). Some scholars recognised women's

agency in the face of intimate partner violence, where instead of taking a bold decision against their male partners, they introduced the concept of "distributed agency", whereby women can make small wins over time (233). In this study, distributed agency refers to how power is shared across the different levels of SEM – individual, household, community, and organisations – thereby shaping young women's autonomy in decision-making. This concept recognises the fluidity of agentic decisions and their dependency on multiple decisions (233). Such decisions can help young women overcome household level barriers and act as facilitators for the uptake of services for the new long-acting PrEP technologies.

Stigma and discrimination from peers and partners have also been identified as barriers at the household level (228). Conversely, partner and family support facilitated PrEP use (228). Additional facilitators included having a partner of unknown HIV status, lack of trust in a sexual partner, and having multiple sexual partners (131). Since stigma has been shown to negatively influence the use of HIV prevention methods such as oral PrEP, it is important to deliver new long-acting PrEP technologies through channels that minimise stigma and promote discrete access. This study, therefore, aims to identify ways of delivering new long-acting PrEP agents through eliciting young women's preferences for service delivery.

2.5.1.3 Health System Factors

Health system factors such as the quality of service providers and waiting times at facilities can influence service delivery preferences for new long-acting PrEP technologies (32). Health provider attitudes, the cost of PrEP, quality assurance, and data protection have been documented facilitators and barriers to PrEP uptake in high-income countries (228). Findings from a study conducted in Ethiopia, which investigated barriers to access and utilisation of health services, revealed that negative health care attitudes made it difficult for adolescents to access care (234). Stigma from health care providers can therefore act as a barrier to young women's access to health services.

Some health system factors, discussed earlier under concepts, include delivery channels, delivery settings, and health service providers. Together, these represent the supply-side factors of health access. In a study conducted among key populations in Uganda, serodiscordant couples reported that the cost of transport to facilities was a key barrier to

accessing health service (235). In addition, the time required to reach a health facility, and whether time off from school or work was needed, emerged as critical health barriers alongside affordability and availability of services (195). Additional barriers included unfavourable clinic opening hours and a limited number of healthcare workers to administer PrEP (34,202). Facilitators of PrEP uptake included friendly and supportive attitudes from healthcare providers towards AGYW (236). Eliciting the young people's preferences for specific health service attributes can therefore help to strengthen these facilitators and overcome the barriers to PrEP access and use of the health services.

2.5.1.4 Community-level factors

Health services are part the community-level factors of SEM. At the community-level, socio-cultural norms, local beliefs, and HIV prevalence in the area are potential facilitators and barriers to PrEP use (32,37). Some studies have shown that product preference and the social environment surrounding acceptability are likely to be population-specific (38). Negative community perceptions about PrEP and its side effects can reduce PrEP uptake (10). Similarly, stigma and discrimination can act as barriers to PrEP uptake and, if left unaddressed, may also hinder the use of new long-acting PrEP technologies (11). Stigma related to sexual activity may include being perceived as a sex worker or as someone living with HIV (224). Understanding these barriers and facilitators across the different levels of the ecological model is essential to inform the design of delivery strategies to counter barriers and maximise facilitators.

2.5.1.5 Policy Factors

Policy plays a key role in shaping the delivery models for HIV prevention services for the populations at risk. Legal restrictions surrounding the delivery of PrEP can either facilitate access or act as a barrier to uptake. For example, the plan to shift from clinic-based delivery of PrEP can be hampered by restrictive legislation (195). Regulatory authorities, such as SAHPRA, are responsible for approving product safety and defining which cadre of health providers can administer specific methods, to which populations, and at what dosages. These regulations also define who is authorised to deliver services and who is eligible to receive them. Currently, for example, the DVR is approved only for use by women aged 18 years and

above. In addition, in South Africa, PrEP can only be prescribed and dispensed by providers with Nurse-Initiated Management of Antiretroviral Therapy (NIMART) training, in accordance with National PrEP guidelines (188). These regulations directly shape the delivery of long-acting PrEP by determining which providers can offer services and under what conditions.

2.5.2 The Diffusion of Innovation Model

The Diffusion of Innovation (DOI) model, developed by Everett Rogers, explains how and at what rate new technologies spread through a population. It categorises potential users into innovators, early adopters, early majority, late majority, and laggards (237). This study applied DOI to long-acting PrEP technologies, using key characteristics off innovation – relative advantage, compatibility, complexity, observability, trialability, and observability – to understand young women's perceptions of PrEP (238).

- Relative advantage describes the degree to which one form of PrEP is perceived as being better than the other.
- Compatibility captures the extent to which the PrEP technology remains consistent with the students' preferences, values, beliefs and experiences.
- Complexity describes the degree to which the PrEP technology is perceived as being difficult to understand or use.
- Trialability relates students' willingness to use the PrEP technology.
- Observability refers to the degree to which PrEP use is visible to others (238).

The characteristics of long-acting PrEP from DOI are linked closely with SEM. At the individual level, perceptions of the technology in terms of its relative advantage, compatibility with lifestyle, complexity, and trialability influence PrEP use. At the household level, partners may influence young women's perceptions of the PrEP technologies and compatibility with their lifestyles. At the health system level, how service providers communicate about PrEP technologies shape students' overall perceptions of the technology.

Summary

This chapter has presented the HIV burden globally, regionally, and in South Africa. It highlighted existing HIV prevention strategies and their limitations, thereby building a case

for HIV PrEP. In addition, the chapter explored facilitators and barriers for PrEP uptake and emphasised the critical role of health service providers in PrEP provision. Finally, the chapter outlined the core study concepts and introduced the conceptual frameworks, the socio-ecological model and the diffusion of innovation model, demonstrating how the two relate to each other.

Chapter 3: METHODOLOGY

The study had three specific objectives. These were addressed using a sequential exploratory mixed methods approach. First, qualitative methods were used to explore participants' perceptions and experiences of using sexual and reproductive health services. These findings then informed the design of the discrete choice experiment (DCE), which is a quantitative method. This chapter outlines the research philosophy underpinning this study, detailing the study setting, the design of the population, and the justification for the selection. It details the sampling procedures, data collection, and analysis. The study aims and objectives were presented in Chapter 1.

3.1 Research Philosophy

This study is grounded in a pragmatic paradigm. A research paradigm represents a set of beliefs and values underpinning and shaping the research process (239). The study focused on young women's preferences for service delivery and the characteristics of services that facilitate or impede sustained the use of long-acting PrEP. Addressing this required the use of both qualitative and quantitative methods.

A pragmatic research approach works well with women-oriented research, as it strengthens both the research process and the outcomes (240) by allowing the capture of multiple world views and thereby enriching the development of practicable solutions (241). It supports the application of mixed methods, selecting the most appropriate approach for answering the study questions. Pragmatism underpins the philosophical premise of mixed methods (241). This approach works well for eliciting young women's service delivery preferences, allowing exploration of both depth and breadth within the topic. Since health problems are complex, exploring and quantifying young women's preferences and trade-offs is important when choosing modifiable service delivery characteristics. This study used triangulation of methods to answer the research questions, aligning with Denzil's assertions that "several methods cross-check each other" (242). Moreover, the triangulation of methods helps explore and explain complex human behaviour

It was essential to start with formative qualitative research. Qualitative research gives young women “a voice” to express their perspectives and experiences (243). Through formative qualitative research, we were able to explore contraceptive use experiences before eliciting user preferences for the PrEP formulations, which were not yet available at the time data were collected. These preferences were later quantified in the quantitative component. Experimental design methods for DCEs call for pragmatism to balance statistical efficiency against respondent efficiency. It is not always possible to ask participants all questions needed to achieve the desired statistical efficiency, as this may result in respondent fatigue; hence, a pragmatic approach is required to achieve both statistical and respondent efficiency (244).

3.2 Study Settings

3.2.1 Sites

The study was conducted in Tshwane sub-district 1 of Gauteng province, South Africa. With an HIV prevalence of 10% among AGYW, the City of Tshwane ranks fourth in HIV burden among the country’s eight metropolitan areas (83). It also has been reported to have the third highest prevalence in Gauteng province (245,246). The study sites were purposively selected because they were part of the *She Conquers* priority district. *She Conquers* is a multi-sectoral, government-led national campaign aimed at reducing new HIV infections in girls and young women, reducing teenage pregnancies, keeping girls in school until completion of grade 12, reducing sexual and gender-based violence, and increasing economic opportunities for young people (10).

Most of the participants resided Soshanguve, a township within the district. The study sites included a university campus and a Technical and Vocational Education and Training (TVET) college serviced by mobile clinics. There are notable differences between the two sites: the university enrols about 60,000 students yearly (5), compared to approximately 20,000 for the TVET college (247). Entry requirements also differ: admission to the university requires successful completion of grade 12, whereas a grade nice certificate is sufficient for TVET entry (248). Programme duration also varies, with universities degrees typically taking three to four years, while TVET programmes range from a few months to a few years (248).

The mobile clinics provided services to both the university and TVET sites, funded through either government or external donor support. Services included oral PrEP, provided free of charge and managed through a nearby Community Health Centre (CHC). In addition, the university site also had a fixed campus clinic, while the TVET site did not.

3.3 Study Design

The study employed an exploratory sequential mixed-methods design, as illustrated in Figure 3.1. This design was appropriate since little was known about the service delivery attributes that would attract students to use services. It has been described as a procedure of choice when developing an instrument because existing instruments are either inadequate or unavailable (249). In addition, it supports tool development, hence identifying these attributes also informed the development of the DCE tool (250).

This approach was suitable for a study with two phases. The first phase consisted of formative qualitative research using in-depth interviews (IDIs), focus group discussions (FGDs), and workshops. Findings from the formative qualitative research informed the development of the DCE. The DCE was then used as a quantitative method of measuring client preferences for service delivery. Prior to this measurement, it was essential to explore the preferred service delivery characteristics that could attract and sustain PrEP use.

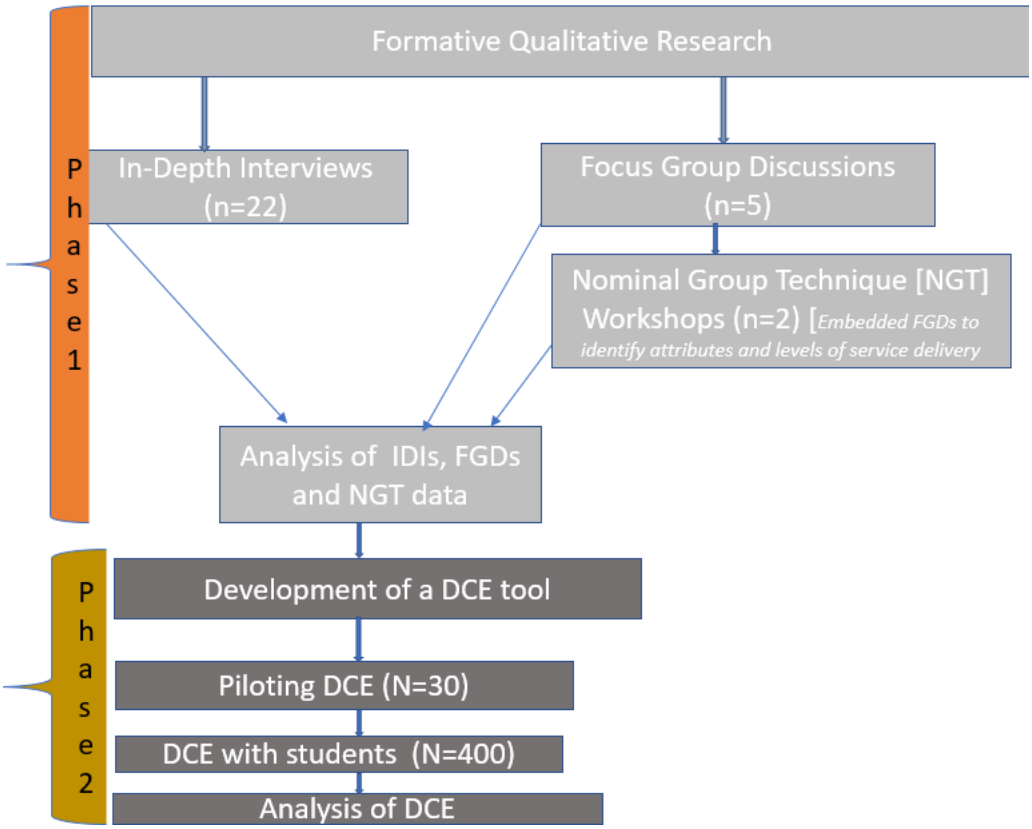

Figure 3.1: Sequential explanatory mixed methods approach

Qualitative and quantitative methods were connected between data analysis of the qualitative component and the beginning of the second phase, which was the DCE (quantitative). The workshop/nominal group technique (NGT) results were first analysed and then used to inform the development of the DCE tool.

3.4 Phase 1 : Formative Qualitative Research

This PhD started with a qualitative formative phase. One of the objectives of this phase was to explore the barriers and enablers of the use and delivery of current contraceptive offerings among young women, with the aim of informing long-acting PrEP delivery. Qualitative research was selected for its ability to explore in depth the why and the how questions (251). The findings of this objective are presented in Chapter 4 (252). The second objective of this phase was to explore young women‘s preferences and willingness to use the new PrEP technologies, DVR and CAB-LA, with the findings presented in Chapter 5 (253). Finally, the last

objective of this phase was to identify attributes and levels of service delivery, which were subsequently used to inform the development of the DCE tool.

Qualitative methods were used to generate data that enhanced comprehension of complex problems, such as personal experiences of PrEP or contraceptive use (best captured using IDIs), perceptions (captured using FGDs), or individual preferences (254,255). This formative qualitative research was therefore guided by the following questions:

- What the barriers and enablers of the use and delivery of current contraceptive offerings among young women?
- What are the students' perceptions of the new long-acting PrEP technologies?
- Are they willing to use these products?
- What are the attributes of service delivery that would attract them to use a service?

Study Population and Sample

The study population comprised female students attending either a university or TVET college who accessed SRH services through the mobile clinics managed by a nearby CHC and the university campus clinic in Tshwane sub-district 1. Most participants accessed contraceptive services, while others sought different SRH services, such as STI treatment and oral PrEP, at the mobile clinics.

Female students were purposively selected from mobile and campus clinic waiting areas where they were accessing SRH services. The participants were aged 18-24 years and sexually active. Trained female data collectors provided study information to potential study participants in the waiting areas, and those expressed interest volunteered to participate.

A total of 22 students participated in IDIs and 43 participated in FGDs. This age group was selected because it represents the cohort with the highest HIV incidence rate in South Africa (256). The average age of participants in the interviews was 21 years. As explained in Chapters 4 (252) and 5 (257), sexually active female students who had used contraceptives and were interested in participating in the study were approached by the trained female data collectors who obtained consent from them (253).

Data Collection

All qualitative data were collected in person between August 2022 and March 2023 by two trained interviewers. IDIs and FGDs were conducted between August and September 2022, while workshops were conducted between February and March 2023. Details of the data collection process are described in Chapters 4 (252) and 5 (253). All participants underwent a formal consent process. Participant information sheets [PIS] [Appendix B, C, D] issued by data collectors, provided the study information for IDIs, FGDs, and workshops. After going through the PIS with the data collectors, participants signed informed consent forms [Appendix E, F, G] and audio-recording consent forms for IDIs, FGDs, and workshops [Appendix H, I, J]. All IDIs, FGDs, and workshops were audio-recorded.

3.4.1 Qualitative Interviews

Qualitative data was collected using IDIs, FGDs, and workshops. Semi-structured interview guides were used for both IDIs and FGDs [Appendix K: IDI guide; Appendix L: FGD guide; Appendix M: workshop guide]. Probes were applied where further clarification was needed, particularly in IDIs and FGDs. The interview guides were divided into sections aligned with the study objectives and other themes. Through the workshops, attributes and the related levels were identified. Trained female data collectors conducted the interviews in English (253). To ensure audio privacy, interviews were conducted in quiet spaces such as a boardroom or outdoor areas. More details about the interviews are provided in Chapter 5 (253).

Table 3.1: Summary of methods used to achieve objectives

Objectives	Method used	Study population sampling	Recruitment	Data analysis method(s)
1. To explore the barriers and enablers of the use and delivery of current contraceptive offerings among women students to inform the delivery of long-	In-depth interview (n=22) Focus Group Discussion (n=5)	Female students (18-24 years) Purposive sampling	Students were recruited from the university campus clinic waiting area, mobile clinics, and the TVET College campus	Thematic analysis

acting PrEP formulations				
2. To explore young women's preferences and willingness to use the new PrEP technologies – ring and long-acting injectable at two tertiary institutions in Gauteng province	In-depth interview (n=22) Focus Group Discussion (n=5) Workshops (n=2)	Female students (18-24 years) Purposive sampling	Students were recruited from the university campus clinic waiting area, mobile clinics, and the TVET College campus **For the workshop:** Participants who actively participated in FGDs in the early stages of the qualitative formative research and had agreed to be contacted in future to participate in the workshop were invited to a workshop.	Thematic analysis
3. To identify and determine service delivery characteristics that are most important in encouraging students to take up long-acting PrEP	Two workshops (n=22) DCE survey (n=400)	Purposive and convenience sampling	**For the DCE**: Students were recruited from the university campus clinic waiting area, mobile clinics, and the TVET College campus	Thematic analysis (qualitative) and Multinomial logit model, Mixed logit model, Latent Class Model

3.4.1.1 In-Depth Interviews

IDIs were selected to explore young women's personal experiences using contraception and oral PrEP within the context of their intimate relationships, peers, and families. The exploratory design of the IDIs encouraged participants to express themselves freely about their service delivery experiences and perspectives on HIV and pregnancy prevention, issues they may not otherwise share in a group setting (258). IDIs also allowed for the generation of

data with greater depth and richness (259). Most participants had experience using contraception, and as previous studies have shown, important lessons from contraceptive research can be applied to the use of PrEP for HIV prevention (74). Contraceptive users were therefore purposively recruited to provide insights into long-acting PrEP service delivery, drawing important lessons from their experiences. Similar lessons were also drawn from current and past PrEP users' experiences, as some studies have demonstrated links between contraceptive and PrEP choice (232,260–262).

3.4.1.2 Focus Group Discussion

In addition to IDIs, FGDs were also used to collect data as they offered additional benefits which IDIs could not offer. With the assumption that most participants would not have used the new methods unless they had participated in clinical trials, FGDs were able to capture students' perceptions of the DVR, CAB-LA, and other HIV prevention methods. FGDs collected data on logistics and preferences for service delivery (attributes), such as clinic location and frequency of visits, to explore a more focused student community perspective of the new products' acceptability (263). FGDs also allowed for the emergence of shared meaning, something which could not be achieved through individual interviews (264). Shared meaning is important in qualitative research as it allows for the understanding of the meaning and interpretation that participants assign to their experiences (265). In addition, it enhances the validity and credibility of the research findings.

The FGDs were homogeneous groups of 6-10 purposively selected young women. The selection criteria for FGD participation was similar to the IDI criteria. We included young women (18-24 years) who had experience in using different forms of contraceptives, such as pills, implants, and long-acting injectable methods, and also experiences in using different HIV prevention methods, such as oral PrEP. A few had used oral PrEP, with some currently using it, others had discontinued using. These different experiences helped bring in different views in the discussions.

3.4.1.3 The Nominal Group Technique (NGT)

In addition to IDIs and FGDs, the NGT was part of the formative qualitative research. The NGT is a highly structured technique that limits the researcher's influence in generating ideas and setting priorities, preventing dominant people from controlling the discussion (266). This was done through workshops with embedded FGDs or small groups. NGT was suitable for this PhD as a decision-making and consensus method (264). The NGT also had unique benefits and was used to identify PrEP formulations and service delivery attributes preferred by students. This important NGT benefit of identifying attributes of service delivery and the associated levels then informed the development of the DCE tool.

The first workshop was conducted with nine participants at the TVET college site and the second at the university site with 13 participants. They provided input on service delivery attributes and attribute levels for long-acting PrEP —DVR, lenacapavir and CAB-LA. The workshops were conducted with the following steps: generating the ideas individually, recording and discussing all the ideas in a round-robin format, and ranking the ideas in order of importance (264).

At the beginning of the nominal group discussion, data collectors explained the purpose of the study to the participants and provided feedback from the FGDs, as the participants were drawn from the FGDs. Data collectors discussed the different service delivery attributes and levels that came out of the FGDs. Most participants agreed with the feedback. To build consensus and reduce the number of attributes and levels to manageable levels participants broke into small groups to discuss and debate the service delivery attributes.

At the university site, the 13 participants broke into three groups, and the nine participants at the TVET college broke into two groups. Each group was given a flip chart, whiteboard markers, note pads, and pens to write down their preferred service delivery characteristics. Initially, in the small groups, all participants thought of important service delivery characteristics that would attract them to use the service and wrote them on paper without discussing them with other participants. In a round-robin format, the data collector asked each participant to say what they wrote. The facilitator then wrote all the responses on the flip chart and went through all the points, asking all the respondents to clarify each without

necessarily asking the person who raised the point to clarify it. Each group ranked the attributes and developed the top five attributes until a consensus was reached. The same process was repeated to identify the levels for each characteristic of service delivery until a consensus was reached. After each group had identified at least five attributes of service delivery and at least three levels of each characteristic, the groups came together, and a representative from each group provided feedback to all participants with opportunity for questions.

Each group wrote their top five attributes and levels on a flip chart. The facilitator then synthesized these top attributes into a single list through a plenary discussion. Participants listed the attributes of service delivery, justifying their choices in the process. The preferred characteristics of service delivery were then ranked. Participants were then given three stickers, which they pasted on the flip chart. The ranking was then done according to the number of stickers on each option. The option with the most stickers was ranked first, and those with the least stickers ranked last, while those with no stickers were eliminated. The final ranking was then reached through consensus; hence, the NGT was suited for this study. The NGT also has the advantage of balancing participation across members, unlike FGDs, which can be dominated by a few (103). The workshops took 1.5-2 hours.

3.4.2 Tool Development

We developed IDI and FGD guides to collect data for the formative phase of the study. We adapted an IDI guide developed by Galea et al., which examined the acceptability of oral PrEP and assessed preferences for its attributes among female sex workers (FSWs), men who have sex with men (MSM), and male-to-female transgendered persons (267). The IDI guide was developed to cover young people's personal experiences of using HIV prevention methods and contraception. The experiences included facilitators and barriers to using these methods using the SEM framework described in Chapter 2. In addition, the IDI guide also had questions that sought to understand how the young women had dealt with the identified challenges, including their preferences for service delivery. Willingness to use new long-acting PrEP agents when they become available was also explored using the SEM. A similar approach has

been used by a systematic review that looked at willingness to use HIV PrEP among MSM in low to medium-income countries (32).

A semi-structured FGD guide, informed by a study conducted in Malawi to explore FSW preferences for delivery of oral PrEP, was developed. It covered topics such as facilitators and barriers to the use of contraception and HIV prevention methods, including oral PrEP, willingness to use DVR, CAB-LA, Islatravir, lenacapavir, and the preferences for service delivery (268). In addition, the IDI and FGD guides identified attributes of service delivery that students valued. The IDI and FGD guides were pre-tested to refine the questions and ensure their clarity. A nominal group discussion guide (Appendix L) adapted from Dunham (269) was also developed to guide the nominal group process.

3.4.3 Qualitative Data Analysis

NVivo 12 (QSR International) was used to analyse qualitative data. Two data collectors transcribed the interviews. After transcribing, the data collectors checked each transcript against the audio and then swapped their transcripts, double checking them against the audio recording. The transcripts were then sent to me as the study principal investigator (PI), and I triple checked them against the audio recording. As qualitative data analysis is an iterative process, data coding was undertaken using an initial set of codes that were refined throughout the process.

A thematic approach to data analysis was taken. The approach involved the systematic identification, organisation, and development and provision of insights into patterns of meaning (themes), across the dataset (270). Six steps as recommended by Braun and Clarke were followed in thematic analysis: familiarisation with the data; generation of initial codes; searching for themes; review of potential themes; defining themes; and report writing (271).

This approach was suitable for answering the “what” questions, such as “what are the young women’s perceptions of the facilitators and barriers to contraceptive service and PrEP use and their perceptions towards new long-acting PrEP?” (272). It is also flexible and could be

linked to conceptual frameworks such as the Socio-ecological Model and the Diffusion of Innovations models utilised in this study (271).

Both deductive and inductive coding methods were utilised. This combined approach is suitable for mixed methods and pragmatism (273). A deductive way to data analysis is often described as a top-down approach, whereby the concepts and topic guides are brought to the data (270). Deductive coding was informed by both study objectives and literature. Alternatively, the inductive approach is a bottom-up approach, guided by the data, which leads to the development of codes and themes (274). Inductive coding was developed through deep, repeated reading of the transcripts (275). A codebook was developed, which was updated throughout the data analysis process, as qualitative data analysis is an iterative process (273). Memos were also developed, which helped connect and group similar ideas together. The SEM and the diffusion of Innovations models were kept in mind in the coding process, specifically for the first and the second qualitative manuscripts [Chapter 4 (252) and Chapter 5 (253)]. The codes were discussed and debated with our supervisors until an agreement was reached.

The triangulation of qualitative methods used in the formative stage helped integrate the PhD findings for the thesis. Initially data triangulation was achieved through analysing IDI and FGD data separately to identify themes and patterns. Later on, we identified similarities and differences, leading to the integration of the findings. Using NVivo 12 software helped in the identification of similarities and differences between the IDI and FGD data.

3.5 Enhancing Study Trustworthiness

Trustworthiness is a measure of rigour in qualitative research (276). Trustworthiness can be examined using concepts of credibility, dependability, confirmability and reflexivity of the study findings. Using a “thick description” is one way of ensuring credibility through describing the context of the phenomenon being studied (277). Triangulation of methods adds to the credibility and confirmability of the study results (278). In this study, it refers to the use of more than one method, such as IDIs and FGDs. Working with data collectors triangulated researchers as it allowed for debrief sessions and check-in sessions to check the

interpretations of the data. As Denzin points out, no single theory, method, or observer can capture everything important and relevant in reality (242). The dependability was supported through the creation of an audit trail through documentation of the study processes (279). Notes and memos were kept throughout the process of coding and theme development to document decisions that were made and to highlight analytic insights. Confirmability is about establishing that the researcher's findings and interpretations are derived from the data and also the demonstration of how interpretations and conclusions have been reached (280). This is achieved by reporting study findings to the participants so they can provide feedback, either agreeing or disagreeing. Through the workshops, participants were informed of the findings from the FGDs and had an opportunity to agree or disagree. Reflexivity is central to the audit trail and is about keeping an account of the research process, including the researcher's internal and external dialogue (280,281).

3.6 Researcher's Positionality and Reflexivity

I was the principal investigator in my PhD study. As a Zimbabwean national, I was an outsider to my study participants - South African young women in tertiary institutions. I was not conversant in any of the local languages and had to rely on my data collectors whenever the participants used any vernacular language. This could have compromised the quality of the data. However, the two female data collectors cross-checked each other's work, which helped minimise the risk. Merriam describes the insider/outsider debate, which is part of positionality, as explaining where one stands in the research process (282). An outsider is external the group being studied, whereas an insider is considered part of the community (283).

Positionality and reflexivity concepts in qualitative research can be explained by the social constructivism theory, which was developed by Lev Vygotsky, a Russian psychologist. Social constructivism explains how learning occurs and the nature of knowledge (284). It also explains how individuals, especially students, learn through interactions with their peers, parents, and teachers, and acknowledges their active role in creating their knowledge (285). As the primary researcher in this study, I had an active role in analysing and interpreting the data collected from the young women in this study. My position was influenced by my

education in social sciences as well as my reading throughout the PhD and through discussions with supervisors.

Pierre Bourdieu, a French sociologist, was one of the early proponents of reflexivity. Reflexivity is defined as "conscious, active acknowledgement of one's own belief, bias, and judgement systems before, during, and after the actual research process" (286) [page 2]. At the time of data collection and analysis, I was working as a researcher, focusing on projects that looked at the implementation of PrEP in South Africa since 2016, when it first became available to female sex workers. My experience working in PrEP-related projects shaped my understanding of PrEP and SRH issues in general, including contraception. My work experience and prior PrEP knowledge aided my analysis and interpretation of the research findings. My knowledge and experience working in the PrEP field might also have influenced my view of PrEP and my analysis. I approached the study from the perspective that PrEP is an important part of HIV prevention and that if it is delivered to young women in a way that is sensitive to their needs, they would be more inclined to initiate and adhere to it. However, my experience in working on a PrEP project might also have introduced some bias in data analysis. However, having discussions with my supervisors helped minimise this bias.

When we conducted workshops, students viewed me as an expert in PrEP and asked many clarifying questions on PrEP. They trusted me as a reliable source of PrEP information. As I started the community entry process, before starting data collection, I went to one of the college campuses and the contact person was excited to see me and wanted to engage me in health talks with students so I could share SRH information. I was given a very warm welcome and she asked me to talk about STIs and pregnancy prevention, as these were the main problems she identified, especially among first-year students. I, however, explained that I could not have this talk with young women who were potential study participants, as it could introduce social desirability bias.

3.7 Phase 2 : Discrete Choice Experiment

This PhD used a DCE approach to determine service delivery characteristics that attract young people to long-acting PrEP. The approach is suitable for looking at values and preference

studies. It is a stated preference method derived from surveys rather than a revealed preference derived from actual market activities (11). While revealed preferences are directly observable from the real-world market, stated choice can be derived from hypothetical scenarios (287). Stated preference methods have the advantage of a moderate cost, even for collecting large quantities of data. A DCE approach assumes that goods or services are described by their attributes and that individual valuation of them depends on the levels of these attributes (288). The main aim of the DCE was to determine trade-offs and preferences for service delivery characteristics within the student population (263). A DCE is a quantitative method used to measure the strength of these preferences and trade-offs among the attributes. Trade-offs are important as resources are limited, and young women cannot have the best levels of all service delivery characteristics; hence, they allow policymakers to estimate how much of one attribute young women are willing to forego for another (289). A trade-off is "an exchange in which a participant gives up some amount of one attribute to gain more of another." [page 2](290).

3.7.1 Study Population DCE

The study population was similar to the qualitative component of the study, as these were all female students (18-24 years). As discussed in Chapter 6, most of these young women were accessing contraceptive services, while others sought different SRH services, such as STI treatment and oral PrEP, at the mobile clinics or campus clinic at the university (257). Almost all the participants had a mobile phone and had access to the internet. The participants were all resident in Soshanguve, a township in the City of Tshwane.

3.7.1.1 Sampling, Sample Size, and Sampling Procedures

A non-probability sampling technique was utilised in the study. Convenience sampling was used to recruit female students who were accessing SRH services at the selected campus sites. Trained data collectors addressed students in groups and explained the study details to them. The students who were interested in participating in the study approached the data collectors, who then took them through an informed consent process before taking part in the survey. Participants signed the ICF (Appendix X). The demographics summary is reported in 6.2, Chapter 6 (257).

3.7.1.2 Data Collection

Between September and October 2023, all data were collected face-to-face at the two study sites. The DCE survey comprised 16 choice sets, which were administered to participants on computer tablets using REDCap. The DCE survey took 30-45 minutes to complete. Participants were also asked some socio-demographic questions and a few questions on SRH, including service utilisation. Details of how data were collected are described in Chapter 6 (257).

3.7.2 Discrete Choice Experiment

This PhD used a DCE approach to generate quantitative data. The DCE was an important component of the study as it quantified the preferences and trade-offs made by young women. Appendix O shows the DCE survey, which was captured in REDCap, while Appendix N has the images that were shown to study participants to help them understand the task better.

DCEs are grounded in the Random Utility Theory (RUT), an economics-based theory that postulates that individuals make rational decisions and that goods are described by their characteristics (291). Further, the RUT posits that individuals will likely select a service if the attribute levels give them maximum utility. The DCE approach, therefore, allows for uncovering how potential service users for a product not yet available, such as CAB-LA or lenacapavir, value certain attributes of services by stating their preferences over different hypothetical options they are presented with (292). The responses given are then used to infer the value placed on each attribute. In this study, the information helped show the trade-offs for service delivery attributes students are willing to make. This will guide policymakers in deciding how to deliver the new long-acting PrEP technologies within limited resources (291). The utility is drawn from the attributes of the service and not from the service itself (268).

3.7.2.1 Development of the Experimental Design

Identification of Attributes

The attributes were identified through a literature review and the formative qualitative research described earlier. Identifying the service attributes and the associated levels was described through the NGT process and also in the DCE manuscript. Table 6.1, of the DCE manuscript (Chapter 6) shows the attributes and levels which informed the design of the DCE tool (257). Ryan suggests that there should not be more than five/six attributes per choice set, and Bridges recommends that there should be no more than 3-4 levels per attribute (293,294). This study took a pragmatic approach, and seven attributes were identified through a literature review, formative qualitative research, and consultation with experts in the field.

Experimental Design

The experimental design explains a process where different combinations of attributes and levels are generated for respondents to evaluate in choice sets (244). Once attributes and levels had been identified, the next stage was to develop choice sets. The stage of creating hypothetical scenarios is crucial in the DCE design. Since the attributes and levels had been identified, choice sets were then determined as a combination of attributes (A) and levels (L). For this study, a full factorial design would yield: L^A

$= 2^6 \text{ X } 4^1$

= 256 choice sets.

However, 256 choice sets would be too many in practice; hence, a fractional factorial design, with a full factorial design sample, was utilised (295). This design was created using Hole's D-efficient design, which uses the Fedorov algorithm (296). Zeros were used as priors for the pilot study.

A full factorial design satisfies the four principles of an efficient design, ensuring that D-error is minimised. The D-efficient design minimises the size of the variance-covariance matrix given a prior for β (296). The full factorial design ensures the absence of multicollinearity, whereby there is a high correlation between two variables within the model (297). The four characteristics of a good design are orthogonality, level balance, minimal overlap, and utility balance (295,298). Orthogonality requires that attribute levels vary independently from each other, while level balance requires each attribute to appear an equal number of times across

choice sets (299). Minimum overlap requires that the repetition of attribute levels within profiles be kept to a minimum (289) and utility balance is realised where, within a choice set, the utilities of alternatives are similar (298). However, it is not always possible to achieve the four characteristics in one design. Therefore, this study chose a Bayesian D-efficient design after obtaining priors from the pilot study. Since seven attributes had been identified, a statistically efficient design was considered appropriate for this study. It is recommended for designs with more than five attributes, which have two levels or above, where perfect orthogonality cannot be achieved (288,290,300). Enough questions should be asked to reduce measurement error (21) sufficiently. Sixteen choice sets were presented to each participant on a computer tablet using REDCap. As described in Chapter 6, the DCE tool was designed using the Stata Dcreate software, and the images were obtained from Google. The tool was field tested initially in the pilot phase of the study and then finalised in the DCE survey.

3.7.3 Sample Size Calculation

While DCEs have existed for over two decades, there is no consensus on calculating the minimum sample size required to provide statistical power for hypothesis tests on specific coefficients or subgroups (301–303). Two main approaches are used to calculate the sample size: the rule of thumb or the statistical error of the parameter of interest (304). Firstly, estimating a minimum sample size requires knowledge of unknown parameter estimates; hence, some scholars suggest running a pilot study first to estimate these parameters (295). We ran a pilot study with 30 participants, 15 from each of the two study sites, to get the unknown parameters, which were then used to estimate the Bayesian D-efficient design. Orme recommends a minimum sample size of 200 participants per group if making comparisons and of 300 if not making such comparisons; hence, the minimum sample size for this study was 300 (305).

3.7.4 Quantitative Data Analysis

The DCE data were imported from REDCap to the statistical package STATA 16 for analysis. Descriptive statistics were used to describe the study participants' demographic and background characteristics, such as their ages, where they stayed, and their use of SRH services.

The analysis of the DCE was based on the RUT, explained in **Equations 1 and 2,** which show how the utility of each alternative is a latent construct and a linear function of both the systematic/observed/explainable and random/unobserved/unexplainable characteristics (287). The model is explained by the following equation:

[Equation 1] $U_{jn} = V_{jn} + \varepsilon_{jn}$ (287)

U_{jn} is the utility derived by individual *n* from option j, V_{jn} is the observable component, and ε_{jn} is the unobservable component.

Equation 2 is presented in chapter 6 (257). Using MNL, also known as the conditional logit model, the probability that a decision maker (n) selects alternative (j) is:

[Equation 2] $U_{jn} = (\beta_{frequency} * V_{jn\ frequency}) + (\beta_{support} * V_{jn\ support}) + (\beta_{location} * V_{jn\ location}) + (\beta_{cost} * V_{jn\ cost}) + (\beta_{skills} * V_{jn\ skills}) + (\beta_{sensitivity} * V_{jn\ support}) + (\beta_{waiting\text{-}time} * V_{jn\ waiting\text{-}time}) + \varepsilon_{jn}$

Where V_{jn} is the utility derived by individual n from option j; V_{jn} is the observable component; β is the coefficient attached to V_{jn} a, also representing the part-worth utilities attached to the different attribute levels, and ε_{jn} is the unobservable component

Efficiency in choice designs is derived from McFadden's Multinomial logit model, which assumes that consumers choose alternatives that maximise their perceived utility among the alternatives presented to them (306). The model was preferred for the study as it included an opt-out option, as this study had one (288). The MNL model holds a few assumptions, such as the homogeneity of preferences, independence of irrelevant alternatives, and independence of observed choices (288).

The analysis of the DCE is also described in Chapter 6, where the MNL model was described as the workhorse for the DCE analysis. The MNL model was first used as the basic analysis model for a DCE. However, because of the MNL model limitations described earlier, the Mixed logit model (MXL) was used in this study, where we reported odds ratios and 95% confidence

intervals. Table 6.3 of the DCE manuscript shows the MXL model output. The MNL and MXL model fits were similar. In addition, we did Latent Class Analysis (LCA), which allowed for the detection of unobserved heterogeneity within a sample. Table 6.4 of the DCE manuscript (Chapter 6, (257) shows the LCA output.

3.8 Ethical Considerations

This study was approved by the University of the Witwatersrand Human Research Ethics Committee [Medical] (approval number M2111133) [Appendix A]. In addition, clearance was also obtained from the Tshwane District Research Committee [Appendix P]. Approval was also obtained from the Ethics Committee of the university study site [Appendix Q] and clearance was obtained from the TVET College management [Appendix R]. All study participants received written participant information forms, which detailed what the study was about and what was expected of them. This was complemented by verbal explanations provided by data collectors. Participants were encouraged to ask any questions for clarification purposes before agreeing to participate in the study. Interested participants volunteered and we reassured them that services at the campus or mobile clinics would not be affected should they choose not to participate or to withdraw their consent at a later stage.

Potential benefits and risks of participating in the study were discussed with participants. The participants were told that there were no direct benefits of taking part in the study. However, the indirect benefits of their participation would generate information that would be used by researchers to inform long-acting PrEP delivery. There were no direct risks of participating in the study. To manage risks, participants were informed that they were free not to respond to sensitive questions they were not comfortable with. However, to manage risks, participants were informed they were free to exit the interviews at any point if they felt they did not want to continue. Participants also provided written consent for the recording of all qualitative interviews. All the signed consent forms were stored in a locked cupboard with restricted access. Only the study team had access to the forms. Participants were reimbursed R50 (USD2.9) for their time in the study.

Confidentiality and anonymity of study participants were ensured by using unique study codes automatically generated through REDCap, and unique study numbers were used to identify FGD, IDIs, and workshop participants. All audio files were password-protected and stored in a password-protected laptop. The quotes used in the manuscripts cannot be directly linked to an individual. The names of the two tertiary institutions were kept anonymous in the manuscripts. In addition, to ensure that there was a standardised way to respond to participants' emotional or psychological distress resulting from study participation, a distress protocol was utilised. There were no incidences of distress recorded.

Chapter 4: RESULTS (1)

Patience Shamu, Nicola J Christofides and Saiqa Mullick *(*2025) Facilitators and barriers to contraceptive uptake and use: Perspectives of female students in South Africa and lessons for quality provision of HIV pre-exposure prophylaxis. *PLoS One* 20(9): e0333270. **https://doi.org/10.1371/journal.pone.0333270**

Facilitators and barriers to contraceptive uptake and use: perspectives of female students in South Africa and lessons for quality provision of HIV pre-exposure prophylaxis

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Keywords: Adolescent girls and young women; HIV; Pre-exposure prophylaxis; service delivery and contraceptive use

Abstract

Young women in South Africa face a dual risk of unplanned pregnancies and HIV infections. The country's high contraceptive prevalence rate masks underlying challenges affecting the initiation and maintenance of contraceptive use. Options are freely available at public health clinics and most women in the country use long-acting injectable contraceptives. Young women's experiences of contraceptive services provide a unique opportunity to learn lessons for long-acting HIV Pre-exposure prophylaxis (PrEP). The paper aims to explore facilitators and barriers to using contraceptives among young female students to inform the delivery of long-acting PrEP. A qualitative study was conducted in one district in Gauteng province of South Africa. We purposively selected female students 18-24 years seeking sexual and reproductive health services (SRH) through fixed or mobile clinics in 2022 on two campuses. We conducted 22 in-depth interviews and five Focus Group Discussions (FGDs). Data were thematically analysed using NVivo 12 software. Individual-related barriers were mainly related to the side effects of contraceptives. At a family level, mothers sometimes played a supportive role which enabled continued contraceptive use, yet partners' concerns about side effects were sometimes a barrier. Health systems-related issues included negative health provider attitudes and unfavourable opening hours. Accessing contraceptives over holidays when students travelled was a challenge. Long-acting injectable PrEP may be compatible with injectable contraceptives and could provide an opportunity to align visits. Training service providers on the importance of detailed information on side effects will be crucial. Promoting PrEP among mothers and partners could increase support for continued PrEP use. These lessons can be applied to delivering new long-acting HIV PrEP products near the market.

Introduction

Many young women face a dual risk of HIV infection and unintended pregnancies. The combined risks pose a challenge to the achievement of the United Nations Sustainable Development Goals for 2030. Adolescent girls and young women (AGYW) aged 15-24 years, especially in sub-Saharan Africa (SSA), are disproportionately affected by HIV, accounting for nearly two-thirds of new infections in 2021(307). A national survey conducted in South Africa reported that the HIV prevalence in this age group was 10.9%, substantially higher than that of their male counterparts (4.8%) (109). Also, the annual incidence of HIV among AGYW was high at 1.51% compared to 0.5% among men (109). Despite the availability of many different HIV prevention interventions, such as male and female condoms and voluntary male medical circumcision, young women continue to be disproportionately affected by HIV as these methods mainly are male-controlled (308), leaving women with little control over HIV prevention. Pre-exposure prophylaxis (PrEP) is being rolled out as part of HIV prevention interventions as it gives women power over HIV prevention. Oral PrEP became available in South Africa in June 2016 for female sex workers and the following year for men who have sex with men (309). Access to oral PrEP has now been expanded to everyone considered at substantial risk of HIV through primary healthcare (PHC) facilities. Long-acting PrEP formulations such as the Dapivirine Vaginal Ring (DVR) are now available through selected pilot sites (144). The injectable cabotegravir (CAB-LA) has been approved by the South African Health Products Regulatory Authority (SAHPRA) (310).

The most recent Demographic and Health Survey in South Africa shows that the contraceptive prevalence rate among sexually active women, aged 15-49 years, was

60%. Married women and those in unions had lower contraceptive prevalence (55%) (311). These prevalence rates, based on a cross-sectional household survey, do not capture contraceptive use over time. Women may discontinue use when they decide to become pregnant or for other reasons and then use contraceptives again later. Hormonal contraceptives, especially injectables, are most commonly used and account for 25% among sexually active women (311). The high CPR among sexually active women in the country masks underlying challenges in the quality of care and inequitable access, which affects users' correct and consistent use (84). Studies report that quality of care is integral to uptake and continued use of service (312). In addition, provider attitudes and the availability of contraceptives influence young women's decisions to use contraception.

Among young women in South Africa who had a pregnancy under the age of 20 years, nearly two-thirds (64%) described it as unplanned and 15% as unwanted (311). This indicates that there is an unmet need for contraception in this age group (311). Access to contraceptive services remains a challenge despite the existence of an enabling policy that includes termination of pregnancy (260). Quality of contraceptive services remains a concern, especially for young women (84). Service providers' hostile attitudes towards adolescents and young women discourages utilisation of services (313).

Women who are not using a barrier method (16% prevalence) in addition to hormonal contraception are at risk of HIV. PrEP is a method of preventing HIV using antiretroviral drugs and is considered to have enormous potential in countries with a high-prevalence setting, like South Africa. PrEP grants users, especially women,-control over HIV

prevention and is considered vital in settings where gender inequality continues (314). It is therefore important to draw lessons from contraception services and apply them to the delivery of PrEP. There are challenges related to the acceptance of PrEP, for example implementers highlighted how it was disapproved by the community, especially among parents and religious leaders as it was perceived to encourage AGYW to be sexually active, take risks and to have multiple sexual partners (315). In addition, healthcare providers have also raised concerns that stigma and lack of PrEP awareness among communities negatively affect PrEP uptake and use especially among the adolescent girls (181).

Like contraceptives, expanding choices for HIV prevention is important. However, expanding choices alone without considering how services are delivered may fail to improve the uptake of services and may not address the persistent unmet need. Previous studies have suggested that the quality of service, provider attitudes and availability of contraceptives influence young women's decisions to take contraception (316,317). There is still a need to understand the challenges faced by young women with the use of current contraceptive offerings and apply those lessons to the rollout of new long-acting PrEP methods, especially if the service delivery is to be integrated. We focused on young women aged 18-24 years, as they are at greatest risk of HIV. Students are a priority group as the university environment compounds students' vulnerability as it brings new freedoms likely to result in sexual experimentation (144), including having multiple partners and transactional sex, especially for first-year students who may be leaving home for the first time (318). This paper, therefore, aims to explore the barriers

and facilitators of the use and delivery of contraceptives among female students to inform the delivery of long-acting PrEP formulations.

Methods

Study design

We conducted an exploratory, formative qualitative study between 11 August 2022 and 15 March 2023 to identify barriers to using current contraceptive offerings among students to inform the delivery of long-acting PrEP formulations. The study followed the Consolidated criteria for Reporting Qualitative research (COREQ) guidelines (319). Using the socio-ecological model (SEM), we framed questions on young women's experiences using contraceptive and HIV prevention methods. SEM was selected as it the best for understanding complex, multifaceted issues influencing health outcomes as it acknowledges the interconnectedness of different systems. The model categorises the different factors influencing young women's access and use of contraception into individual, household, organisational, community and policy levels (231). Understanding facilitators and barriers to service utilisation using a multifaceted approach is crucial in informing long-acting PrEP delivery.

SEM was selected as it allows for the understanding of complex, multifaceted influences on health outcomes which is crucial in informing long-acting PrEP delivery. While the SEM was the best for this study, the application of the model had limitations as the study was conducted with young women only and their perceptions of the relationship, family and health service level influences on their contraceptive use. Understanding factors from other perspectives, e.g. healthcare providers, could have been valuable. In

addition, participants did not engage with socio-political (macro-level) factors which is an important part of the SEM. As long-acting PrEP methods become available, these factors, including the service delivery attributes, may influence students' decisions to use the methods. The methodology for this study was previously described (253)

Study setting

The study was conducted in the City of Tshwane, South Africa's Gauteng Province. Of the eight metropolitan areas in South Africa, the City of Tshwane has the fourth biggest HIV prevalence among young women aged 15-24 years at 10% (311). The district was purposively selected as it is part of the She Conquers 22 high-priority districts currently providing comprehensive SRH services through public sector facilities. She Conquers is a multi-sectoral South African government-driven campaign aimed at reducing new HIV infections in girls and young women, reducing teenage pregnancies, reducing sexual and gender-based violence, and increasing economic opportunities for young people (320). Two tertiary institutions, a university and a technical vocational college were purposively selected for the study. The two sites frequently get services from mobile clinics which visit the institutions on certain days of the week. These mobile clinics are managed through a government-run Community Health Centre (CHC). Mobile clinics provide SRH services such as screening and testing for sexually transmitted infections, HIV testing, counselling, making referrals for clients who test positive, and contraceptive services, including oral PrEP for HIV prevention. The services are free of charge to users and are financed through external donor funding supporting the South African government.

Population and sample

Young women aged 18 to 24 years were purposively selected from campus and mobile health clinics where they were accessing similar SRH services. They were selected based on having current or recent experience of contraceptive use. The campus clinic provides similar SRHR offered by mobile services, but they also offer treatment for minor ailments.

Data collection procedures

Trained female field workers experienced in qualitative data collection recruited participants who were aged 18-24 and had used contraceptives. We trained field workers on research ethics, questionnaire administration and field work logistics. Role playing was used to assess comprehension of the data collection procedures. Information about the study was provided to students in the university's campus clinic's waiting area, mobile clinic or from the college campus, and students volunteered to participate. An informed consent process was carried out with individual volunteers. We conducted face-to-face In-Depth Interviews (IDIs) and FGDs in English as the participants spoke diverse languages; however, if participants wanted to express some things in a vernacular language, they were encouraged to do so as the data collectors were multilingual. PS and the field workers field-tested the tools. The field workers both had an honours degree in social studies and were both young women, while PS had a master's degree and also worked as a researcher. Semi-structured interview guides were used for both IDIs and FGDs. FGDs were used to capture students' perceptions of new long-acting PrEP technologies while IDIs explored their experiences of using either contraceptive methods or HIV prevention methods. We conducted IDIs in a boardroom

or outdoors with auditory privacy on both campuses. The IDIs took 30-60 minutes and were audio-recorded. Field workers captured field notes both during and after the IDIs.

The FGDs had 6-10 participants. We recruited participants through the same places as described for the IDIs. Students who were interested in participating in FGDs approached the field workers to provide details of their (321) availability and the interviews were scheduled around the student's availability. The FGDs were 1.5-2 hours long and were audio-recorded. The note taker for each FGD captured notes during the interview.

Ethics approval and consent to participate

This study was performed in line with the principles of the Declaration of Helsinki. Clearance to conduct the study was obtained from the University of the Witwatersrand Human Research Ethics Committee [Medical] [protocol number [M2111133]. Permission was obtained from the institutions' management to conduct the study on campus. We obtained written informed consent from participants for the participation of the IDIs and FGDs and for the audio recordings. Participants received R50 [USD2.9] for participating to reimburse them for the time that they spent in the study.

Data management and analysis

Data were audio recorded and transcribed verbatim. Two field workers checked the transcripts to ensure the excellent quality of the documents before sending them to the researcher for final checking. All IDI and FGD data were coded using NVivo 12 software (QSR International)

During data analysis, PS worked as a qualitative researcher in a PrEP study, which provided additional insights. We adopted a thematic approach to data analysis. Both inductive codes, identified through a deep reading of the transcripts and deductive codes based on the objectives and the literature were developed (321). To maintain rigor in line by line analysis of the transcripts, we ensured a transparent coding process through maintaining an audit trail by writing detailed memos. All transcripts were coded, and during the process, some codes were merged while a few new codes were added. The socio-ecological model was kept in mind during the development of these codes. These codes were then refined inductively. We then generated initial themes and reviewed potential themes based on patterns in the data. Themes and codes were discussed with the co-authors until an agreement was reached, and we finally produced a report.

Findings

Twenty-two young women were selected for IDIs, and 43 participated in five FGDs. We reached saturation on students' experiences of contraceptive and HIV prevention methods use.

As depicted in Table 1, most IDI participants grew up in the Gauteng province. The average age of participants was 21 years. Most of the participants were using injectable contraceptives, Nur-Isterate and Depo Provera. Most of the participants had never used PrEP. Six of the IDI participants had been pregnant before, and five had children. The sociodemographic characteristics of FGD participants were similar to those who

participated in the interviews, with an age range of 19-24 years. The college students stayed off-campus in rented accommodation in the township where the college was located as the college did not provide accommodation. Most university students were staying on campus while a few others were staying with parents, friends or by themselves.

Table 1: IDI Participants' demographic characteristics

Variable	Level	Frequency (n=22)	Percentage (%)
Participant age (years)	19	5	23
	20	3	14
	21	5	23
	22	4	18
	23	4	18
	24	1	4.5
History of pregnancy	Yes	6	27
	No	16	73
Parental status (Have children)	Yes	5	23
	No	17	77
Home Province	Limpopo	7	32
	Mpumalanga	5	23
	Kwa-Zulu Natal	1	4
	Gauteng	9	41
	Eastern Cape	0	0
Type of contraception used	Pills	4	18
	Nur-Isterate	7	32
	Depo Prover	7	32
	Implant	1	4
	Discontinued use	3	14
Childhood residence	Rural	11	50
	Urban	9	40
	Peri-urban	1	5
	No response	1	5
Previous use of PrEP	Yes	5	22.7
	No	14	63.6
	No response	3	13
Total		**22**	**100**

Participants' experiences were categorised into two main themes: facilitators and barriers, with sub-themes encompassing the different levels of the social-ecological framework including individual, relationship, family, community, and health system-related factors. Facilitators were described as factors that enabled the continuous utilisation of contraceptive services in this study while barriers were the factors that hindered the uptake and / or continued use of contraception. Most of the facilitators or barriers were health system-related.

Facilitating factors

Individual level factors

The main facilitating factors for initiation or continued use of contraceptives at the individual level were satisfaction with the type of contraception, the perceived benefits as well as the young woman's agency to use contraception regardless of partner support. Some participants described that their goal to complete studies enabled them to exercise their agency and make decisions that would support achieving their goals.

> *"I would do my studies and I would know what I'm getting myself into, so, no matter his response, I'm the one that will be left to make the decision [about contraceptives" [***IDI Participant 03-01-05, 20-years]**

The perceived benefits of using contraception cited by participants included preventing pregnancy; and using an injectable contraceptive meant only having to return to the health facility every two months. Also, contraceptive methods which provided additional off-label benefits included having a clear skin that was free of acne and pimples.

*"Until now, I can see that the benefits were that acne was less, compared to now… I also saw that they were also benefiting me in another way that I didn't expect… the positive side is that they helped me to prevent acne, and at the same time they also helped to prevent not being pregnant and all you know, yeah." [***IDI participant 01-01-12, 22-years***]*

Young women also reported other perceived benefits of using contraceptives. These included having hormonal balance as they said they believed that they suffered from hormonal imbalances before using contraception. Other participants were satisfied with gaining weight as they used the contraceptives. A participant said, "*My experience about Nuri [*Nuristerate*] ne, ahh Nuri was treating me so fine because I gained weight, which was good to gain weight"* **[IDI participant, 01-01-06, 19 years]**

Relationship and family factors

Partner and family support enabled the continued use of contraceptive services. Partner support included reminding participants to go for their next appointment or accompanying them to the health facility.

"*…my partner supports me, and he makes sure that I don't skip, he even accompanies me here, so yeah"* **[Participant P27, FGD 03-01-01].**

A student explained how having clear goals and sharing them with her partner enabled continued use of a contraceptive method. She explained,

"…for me, my partner knows that I am preventing pregnancy like this I explained to him that I want to get somewhere in life where I would feel comfortable to

have a child, I don't want to have child whereby it will be a burden, my child and I are going to be a burden to my mother and then I am being raised by a single parent so I don't want that for myself." (**FGD01-01-03, P23).**

Getting family support from mothers supported continued contraceptive use. Mothers played a key role in providing information on the methods suitable for their daughters. In addition, some mothers played a monitoring role checking that the participants had not missed their appointments to get their contraceptives. A few mothers provided practical support either by providing money or driving their daughters to the health facilities.

"*…when my mother has money she'll give me to go to the clinic…to the doctor, but if let's say I got injected 2 months back then they give me a return date and I'm home, then I'll be able to go to the clinic, but if I skipped my return date like now, I didn't get injected then she will give me money to go to the doctor. When I get to the doctor I buy a pregnancy test to show them that I am not pregnant then I get my injection." [***IDI participant 01-01-06, 19 years].**

Mothers also played an advisory role in contraceptive method choices based on their beliefs and perceptions about the different methods. A participant explained how her mother advised her on which contraceptive method to use:

"*I started my contraceptives with depo, so my mother told me that, no, usually depo is used by women who already have children because it makes you fertile. So, when you stop injecting, like using the injections, you immediately after 6 months fall pregnant. It's best I use the two months one because I'm still young,*

and I'm not in the process of starting a family anytime soon." ***[*Participant 23, FGD01-01-03].**

Heath service factors

Positive provider attitudes facilitated contraceptive service use continuation. Positive attitudes were mainly reported by students accessing services through mobile and campus clinics which participants perceived were very different from those at PHCs. In FGDs, students agreed that providers at mobile and campus clinics had positive attitudes, which enabled regular access to the services. They explained that the providers were approachable and that the students could share personal issues with them. They also reported being satisfied with how nurses counselled them on the potential side effects of contraceptives.

"*they are perfect you communicate when you have uhm, personal things you speak with them they interact everything is good they are perfect, they are good."* [**Participant P17, FGD 01-01-01].**

Good service delivery for students was about being spoken to respectfully in a non-judgemental way, ensuring privacy, confidentiality, and having short waiting times before the consultation. Some participants spoke about the encouragement to prevent pregnancy they received from providers who stressed the importance of preventing pregnancy when they were not ready for it.

"The services are great because they encourage you that hmmm…it's better to prevent, than for you to uhmm…bring a child into this [world], having to uhmm…go through all the emotions of having a child, being a mother when

*you're not ready while you're still a child yourself basically, you see so they just say that, it helps decrease the chances of teenage pregnancy, yeah***." [IDI Participant 03-01-05, 20 years]**

The way services were organised contributed to the continued use of services. Providing privacy to clients through separating family planning clients from others was another important factor.

Barriers to the use of contraceptive services

Individual level factors

Side Effects

Most students reported experiencing various side effects as they used contraception. These were mainly related to their menstrual cycle, such as irregular periods or heavy bleeding. Some participants also reported amenorrhea. Some young women saw it as a problem.

"*…I think it's been almost four months I haven't been to my periods and then I also used the, the injection, the two months' injection and it was going well I didn't have anything, there was nothing wrong that, it worked very well, it worked very well with me."* **(P15, FGD participant]**

While some participants were happy with weight gain, it was a concern for others. When other side effects accompanied it, it led participants to change methods or discontinue contraception.

"*…and my experience was quite bad with the two-month injection, I had too many side effects, gained weight, I even had a rash at one point, which led to a yeast infection of some sort. So, now I'm considering to actually take uhm…pills instead of the injection, maybe they will work better for me*" **[P9, FGD participant].**

Participants also reported experiencing headaches which led to the discontinuation of contraceptive methods as they disturbed studies. A participant said*, "but some days you felt like the headache was intense so you like hmmm I can't cope with stuff like this while I have to study, so I was like I am not going to continue with this*" **[01-01-14, IDI participant, 23-years].** In addition to experiencing headaches, some participants also reported having mood swings due to contraceptive use. A participant said, "…*and then it's also a thing of my mood swings, my mood would escalate or be low and then also hmmm…I had constant headaches*" **[IDI participant 01-01-14, 23 years].** Headaches were a reason for method discontinuation.

Fear of infertility was another perceived side effect reported by some participants. The participants feared that they might end up being infertile because of experiencing heavy bleeding. A participant reported that*, "It was too much. I thought I was losing too much blood or something… and I'll end up not having kids"* **[03-01-02, IDI participant, 23 years]**. Other participants experienced prolonged periods, which took almost a month. A participant explained, "… *I once used uhm…implant and then… maybe I would have my periods maybe for 25 days*" **[P19, FGD01-01-01 participant].**

In addition, some participants reported that they continued experiencing various side effects despite trying different methods and ended up discontinuing contraceptive use. One participant expressed frustration with the current contraceptive offerings after almost exhausting all the available options:

> *"I've tried almost all the contraceptives because I think eish I don't, I don't get to get the contraceptive that actually works for me, I have tried implant it was causing headaches, nausea, excessive appetite and I've tried both injections. I was always on my periods with both of the injections and then I tried the pills. I would get an infection in my vagina it would cause me watery discharge and UTIs."* **[P11, FGD Participant].**

The participant then opted for an intrauterine device (IUD), but the doctor advised her that she could not get it as she was already struggling with infections and urinary tract infections (UTI), and the loop was going to worsen the problem.

Struggling with adherence

Taking pills was difficult for some participants who were concerned that they would forget to take them. Being forgetful was reported to lead to the failure to take contraception.

> *"I was scared to use contraceptives because my period they are not regular periods, so I went to the clinic and they, they opted for the oracons and say they would help regulate my cycle. So I started using them and yeah I could see my period when I'm taking the red pills and then now my problem was that eish I'm forgetful…*" **[P14, FGD participant]**

Experience with health services

Previous negative experiences with the health system deterred students' future use of the services. Negative experiences at health facilities, such as being made to join the same queue as sick people, made some students stop going to some PHCs to get their contraception. In addition, the participants complained about spending long waiting times. A FGD participant reported that,

> *"I stopped going to the local clinic, on recess, because when I went there I have to queue with the people who are sick…. like maybe I will go there around 9 and then now I have to leave the clinic like around 5, let's say knock-off hours, and I'm not going there for, you know like I'm not sick. I'm just here for a simple thing, it won't even take five minutes…."* **[FGD Participant, P27].**

Communication with healthcare providers

Language barriers hindered some students from accessing reproductive health services. Students coming from other provinces where different languages were spoken were struggling and some ended up deciding not to access the PHCs. One participant said,

> *"At school, no, I have never been to the clinic at school I can only tell you about the service where, where at home where I'm coming from because even here it's difficult for me to, to understand because they speak their language and I don't understand their language but the one, the language that I understand from back at home."* **[IDI 3-01-09 participant, 21-years]**

Not having a sexual partner

Not having a sexual partner resulted in some students discontinuing using a contraceptive method. Some students reported that they stopped using contraceptive services during vacation as they were mainly sexually active when they were back on college or university campuses. A participant explained,

> *"The time when I was using nur-isterate ne, whenever I went home, I stopped using it because I did not see the need for using it, because I'm home. When I'm home, I'm home, okay. There is no boyfriend. Yeah, remember he stays in Joburg [Johannesburg]"* **[Participant P26, FGD 01-01-01].**

Relationship and family factors

Partner influence

Male partners were potential barriers to contraceptive use. Some participants reported how their partners discouraged them from continuing to use contraception, especially when they were experiencing some side effects. The partners had misconceptions fearing that the methods would affect their partner's fertility in future.

> "*…he said I must stop using them because they are not right and I'm not having my period at all, what if uhm…after some years when we wanna [want to] have a baby I don't get a baby because the contraceptives have done something to my body as I'm not going to my periods at all"* **[Participant P14, FGD 01-01-01].**

Mothers' influence

Participants reported how their mothers played a key role in influencing their decisions to use contraception. Many mothers provided advice and encouragement; however, a few mothers did not want their daughters to use contraception as they were expecting grandchildren. A participant said, "*yeah for now my mother says… she only wants a*

grandchild. She says, stop this thing, man." **[P33, FGD01-01-04].** The young women however secretly continued using contraception.

Friends' influence

Participants reported how their friends' bad experiences with the health delivery system negatively influenced their decision to use the health services. A participant narrated how her friend was ill-treated at a facility as she sought termination of pregnancy services. The friends then decided not to visit that health facility again. She argued that,

> *"There's no way you going to go back to that clinic. …, they did it to my friend, and as a friend, I would like to support, and when she said "I am no longer going there", I said yes you're no longer going, we go together. So I think it's high time, our nurses, because they are older women, they should be taught how to treat us, they should be taught about our self-esteem. Some, we don't come from like a group of women that makes us strong about our confidence."* **[Participant P23, FGD 01-01-03].**

Friends' negative perceptions of contraceptive use discouraged their peers' continued use of services. The friends shared the myths they held against modern contraception use.

> "...*With me, I think it's the stigma within my peers, you, you'll hear her saying, why are you preventing, why you giving this and that, you going to have a loose body, you going to lose your shape, you going to gain weight, you going to have a wet vj [vagina]"* **[Participant P16, FGD 01-01-01]**

Community factors

Furthermore, participants explained how their communities had judgmental attitudes towards contraceptive use and believed that some contraceptives were similar to having an abortion. Some of the community members openly expressed their disapproval of young women, especially adolescents, using contraceptives.

> *"In my community, they take it bad. I don't know why because there is quite a high number of teenage pregnancies, but still, when you go for prevention they kind of make it feel as if you are doing a bad thing, or you are doing abortion in advance. They think… they usually say that you're blocking the kids with injection."* [**P11, FGD Participant**]

Health system factors

We identified several health system-related factors which functioned as barriers to students' use of health services. These include long waiting times, privacy, service provider attitudes, unfavourable opening hours, and low quality counselling services. Students also pointed out how the health service providers' failure to provide counselling could lead to discontinued use of services.

Waiting time

Long waiting times deterred some students from accessing contraceptive services. Most students reported waiting longer at PHCs and mobile clinics. A participant who thought that the waiting time at a PHC was too long said,

> *"You know that when you are going to the clinic you have to get a lunch box or something because you are going to stay the whole day. That's why a lot of girls*

don't prevent because you know that if I want to prevent it means like the whole day I'm there." **[P15, FGD participant].**

Lack of privacy

Lack of privacy at health services was one of the barriers students cited the most. There were different conceptualizations of privacy. Firstly, the students were uncomfortable with having their neighbours at home, knowing they were accessing SRH services. A student explained,

"*… at home, there is no privacy. Your neighbour, who is there for something else would probably know that you went to the clinic."* [**P14, FGD Participant]**

Secondly, privacy was about not mixing with clients at the facility for different issues. The students felt they were not sick and did not want to mix with others. Mixing clients compromised privacy as some providers at PHCs would then go around the queue asking clients what services they intended to access on that particular day. A participant said,

"You are there just for prevention and they just make you queue with everybody else and when you go there, you have to like… when they ask you what you here to do, you have to speak louder, I came, I came to prevent, contraceptive, what, I came to prevent. So everybody must know your business." **[Participant 14, FGD01-01-01]**

Participants believed that being in the same queue with other clients meant that it would take longer to get contraceptives. This was especially related to PHCs rather than campus clinics. In addition, students were sometimes asked to bring urine samples and had to pass through other clients while bringing the sample:

"…*there, there is no privacy when you have to urinate. You go to the outside toilet, and you come back with urine in front of people and stuff, yeah*…" **[Participant P17, FGD 01-01-01]**

Service provider attitudes

Negative service provider attitudes were another barrier to contraceptive use among students. Students highlighted that providers would call each other when a client had missed an appointment date and address them in front of their peers. Students felt that such behaviour from service providers had a negative impact on their self-esteem and confidence. A student explained:

"… when you missed your date, maybe you skipped by one month, you get stigma and then they're so rude to a point that they call one another, "come see, come see, number 23, come see this child, but sis what's wrong" Then imagine in front of your peers they do that to you, they ruin your self-esteem, and your confidence." [**P23, FGD 01-01-03 Participant**].

Unfavourable opening days and times

Some students highlighted that they discontinued contraception because they could not access services at their local facility during their convenient times. One student reported that in addition to waiting long hours, she failed to access modern contraceptives from the same facility, which does not provide contraceptive services on Fridays and weekends. She said,

"…*in my local clinic … you take the whole day and then the other issue is that you cannot go on Friday, or Saturdays because they don't work with preventions on*

Saturdays like at all. They require you to come during the week, and then when I was preventing, I was in high school then, so I did not have time, so it's either it's the weekend or nothing, that's why I stopped preventing, because in, in grade 10 and 11 it was fine because I had time, in grade 12 I did not have time all." **[P15, FGD01-01-01 participant]**

Low quality counselling services

Participants reported that they did not receive adequate counselling services. They felt the providers did not have enough time to explain contraceptive use and possible side effects. Students explained that the nurses forgot to inform them about what to expect, for example, gaining weight and guidelines on how to eat so that the young women would not gain excess weight.

"*… sometimes the way the nurses are, they don't take their time to explain, they forget to tell you that yes, you will gain weight, but your responsibility is to eat well. Eat healthy food when you feel that you are hungry, because you will be hungry often, but eat healthy. Have fruits in your room, have snacks that are…peanuts, that are healthy.*" [**P23, FGD Participant]**

Being turned away from health facilities

Students are a mobile population. Some students reported being turned away from PHCs in their home areas as they were asked to bring small notebooks which would be used as medical records that the home facilities recognised. However, when the semester break passed, they could not continue using them as they were not accepted at campus clinics and other facilities outside their home clinics. In addition, students

with campus clinic cards or any institutional emblem or who mentioned that they were studying at the named institution known to have a campus clinic were turned away by nurses at a nearby PHC. The providers often told them they were using the facility's medical supplies. Some students then resorted to copying information from campus cards and writing it on the books accepted by some PHCs, including the dates they were supposed to present at the facility, to avoid being turned away. Students, however, reported that some facility providers suspected they might have been writing in the books.

Service providers promoted misinformation about some methods

Students reported being discouraged from using some contraceptive methods, like the implant, by service providers. Service providers told them that the implant could affect their future fertility. In an FGD participant said, "*Most of the time we're advised that eish, do not use the…the implant because you do not have a child, so it might affect you in the future, that's what we are told. Hence most of us are not using it."* **[Participant P27, FGD01-01-03]**

Students' recommendations for long-acting PrEP

Participants suggested dealing with some of the family and community barriers to the uptake of long-acting PrEP. They suggested that there needs to be awareness raising directed at parents and community education, which they believed could normalize the use of PrEP and reduce stigma.

> *"I think a way in which we can get parents to know about these things within the community is maybe at schools, a high school, especially like they host meetings*

and, and that's where maybe a nurse will come in or somebody and, and just talk to parents, and inform them, so that parents are also… if maybe parents can come with their kids, boys and girls because boys also have their own stigma." [**P14, FGD participant]**

Quality of care

Participants stressed the importance of quality of care. The issues of concern to be addressed if long-acting PrEP is to be rolled out successfully include negative provider attitudes, long waiting times, poor stock management, and lack of privacy. A participant noted that,

"…what I think could be improved is the quality of the service in terms of how they speak to young people." **[03-01-05, IDI participant, 20 years].**

In addition**,** students made suggestions for improving planning, particularly related to stock management. "*I think they can find statistics for people around there so that when they render services, they know how many people there and how many people need those services.*" **[01-01-03, IDI participant 21 years]**

Shorten waiting times

Reducing the waiting time at health facilities was one of the recommendations provided by students. A participant said, "*they should improve, and what is it called? They should improve the waiting period there."* **[01-01-06, IDI participant, 19 years**]. Students suggested some ways which would help shorten waiting time, such as hiring more staff. One participant said, *"Let there be more staff around uhm…that is able to be at the*

disposal to help their patients, let there be someone to guide you in terms of where you supposed to go, let's not all wait for the same person to help us out." **[IDI 01-01-14, participant, 19 years]**

In addition, students suggested that staff should take shorter breaks:

"… they must be fast because when they can go to break, they take like a long time to attend to patients. they must reduce it [breaks] to maybe one hour." [**03-01-06, IDI participant,20 years].**

Improve privacy

Also, students stressed the importance of privacy in service delivery.

"every clinic should have a youth zone so that young people can go like and actually have like enquire and get all the information that they need at their own private space." **[P14, FGD 01-01-01]**

Action to be taken about suggestion boxes

Students had concerns on the way suggestion boxes were being handled at some PHCs. They recommended that healthcare facilities should ensure that suggestion boxes are not locked to allow clients to use them, "…*I think maybe the government must make sure that the suggesting box they don't lock them because most of the clinics lock those suggestion boxes."* **[01-01-01, IDI participant, 23-year-old].** In addition, students said that the suggestion box should be guarded by security personnel, citing examples of facilities with suggestion boxes which were closed to the public for use. Further, they suspected that some facilities threw the written complaints in dustbins.

"*… you see that lots of people are complaining about that clinic, but nothing is being improved to show that they remove those complaints, maybe they put in a dustbin, they don't submit where they are supposed to…*" **[01-01-01, IDI participant, 23-years**]

Younger nurses were more acceptable

To improve service delivery, students suggested that older nurses should be replaced by younger nurses. They highlighted that the older nurses complained that they were old and wanted to go home earlier than the normal time. A participant said,

"*… the old nurses they complain that they are old, they want to knock off at half past three maybe before time or four o'clock. So, I think they must put at least youth there, maybe they will manage the time, cause [*because*] those ones they will tell you about their age."* **[01-01-01, IDI participant, 23 years]**

Discussion

This study explored the different barriers and facilitators to the uptake of current contraceptive offerings among students in tertiary institutions with the view to informing PrEP services. The study contributes to the body of research by adding the voices of young, mobile contraceptive users who are the same young women that PrEP services aim to reach. While other studies have identified facilitators and barriers to contraceptive use, this study was done in the context of HIV PrEP to inform its delivery with the consideration of integrating contraceptive and PrEP services at primary health care services and campus clinics. Applying the social-ecological framework to organize the findings from the study provided insights into facilitators and barriers to service

utilization at different levels. Individual-level barriers in the form of side effects such as headaches were common to both contraception and PrEP hence for the successful delivery of PrEP, proper management of side effects should be ensured to avoid early method discontinuation. In addition, health system-level barriers like negative health provider attitudes were the major barriers to using current contraceptive offerings among students. While previous studies have also identified negative health service provider attitudes as a barrier to service use [11,15], in our study participants faced unique challenges as students. As they are a mobile population, moving between their hometown and the tertiary institution. We found that some barriers to accessing contraception arise as the primary health care clinics in their home areas fail to cater for those who usually receive services elsewhere. The same challenge is likely to arise for PrEP service access.

Our findings on individual barriers such as side effects are similar to reports of young women who had ever used oral PrEP which led to discontinuation due to the perceived severity of side effects [24,25]. Side effects if left unchecked could ultimately limit choices. Headaches are a common side effect of both contraception and PrEP (324). Since our participants were students, headaches also affected their daily activities, such as studying, which influenced their decision to discontinue the methods. Previous studies have highlighted how service providers play a critical role in discussing and managing side effects (325). Our study, however, found that providers did not adequately provide counselling and information on potential side effects. Investing more time discussing possible side effects would be important for the sustained use of

PrEP. Providers should consider prescribing analgesia for headaches when offering both contraceptive and PrEP services.

Family, especially mothers, play a crucial role in contraceptive uptake and continued use. Our findings align with what was found in previous studies where mothers either encouraged or discouraged contraceptive use. Mothers facilitated young women's access to contraceptives by providing information concerning the available methods on the market and guiding their daughters on which methods would work for them. The interesting contribution made by mothers in our study was the practical support they provided to their daughters, for example, after missing appointments, they could give them money to access services through a pharmacy. Also, participants reported being dropped at the health facilities by their mothers to get contraceptives. In addition, mothers played a facilitating role through monitoring and ensuring that their daughters attended appointments. However, in other studies, mothers or caregivers have shown reluctance to communicate to their daughters about contraception or PrEP due to lack of knowledge or socio-cultural norms around sexuality education including the fear that such communication would promote sexual behaviour [28,29]. Mothers or other caregivers will need to be engaged in all these aspects to ensure that they do not hinder successful PrEP delivery. It will be, therefore, crucial to involve mothers in PrEP programmes, especially targeting the promotion of PrEP to families and communities as their support could facilitate young women initiating and adhering to PrEP.

Intimate partners are key influences for contraception use. In some instances, participants reported that they received partner support while in other cases partners

were barriers to continuing contraception. The barriers included concerns from some partners about side effects and infertility. The myth that using contraception causes infertility is not unique to this study setting but has been reported to dominate the sub-Saharan and West African populations (328) Also, the disruption of sexual activities affected the male partners. For example, side effects reported by contraceptive pill users such as vaginal wetness and urinary tract infections (UTIs) affected intimacy and male partners then started to complain and discouraged continued use. Vaginal discharge, itchiness, headaches and UTIs are some of the reported side effects associated with the DVR (149). As new long-acting PrEP methods such as the ring are becoming available, it will be essential to ensure that the male partners have information about the benefits and side effects. If young women support the idea, they could be involved in the counselling and in discussing how to manage the side effects. It will be also important to ensure that potential side effects are manageable, to limit the early discontinuation of contraceptives or PrEP.

Young women's agency can be a facilitator of contraceptive use. Women's agency in this context refers to their ability to define goals and act on them (329) using diverse strategies such as negotiation, deception, manipulation, resistance and subversion (330). While a few participants reported discontinuing contraception due to partner influence, most young women enacted their agency and continued taking contraception secretly. Some scholars have argued that male partners can obstruct use which can be linked to discontinuation and unplanned pregnancies (331). Other studies have however reported how agency has been often constrained by partner, family demands and uncertainty (332). Some participants opted for non-disclosure of hormonal

contraception in order to ensure the continued use of condoms for the prevention of HIV and sexually transmitted infection. Most students also had similar fears about disclosing PrEP use to their partners. Covert use of contraception or PrEP while demonstrating young women's agency may lead to discontinuation in the longer term as the it does not address partner communication and negotiation skills (331). However, covert use has also been viewed as reflecting higher levels of agency (333). It will be essential to empower young women with information on long-acting PrEP and ensure they have the agency to overcome the barriers that may emanate from the partners.

Heath service factors

Waiting time

We found that waiting time plays a vital role in service utilisation. While a similar finding has been reported in other studies (334), our study population were university students hence time is essential in their lives as they must attend lectures and study. Long waiting times imply that they are sacrificing study time including attending lectures. However, shorter waiting times reported at campus facilities could be because such clinics offer services exclusively to students, whereas home clinics are open to the public. In addition, campus and mobile clinic staff is trained to provide youth-friendly services, so even though the waiting time is long, the young women are comfortable with waiting. There is need to test strategies to shorten waiting times especially at public health facilities. This is relevant across different Southern and East African countries faced with similar health systems challenges, especially related to adequate human resources.

Privacy

Our study found that students value privacy in service provision. While previous studies had reported that lack of privacy was a concern (335), our study showed that privacy was especially a concern when students accessed services from PHCs. They explained different dimensions of privacy, including not being seen by older people from their communities while accessing services at PHCs. A similar barrier at the community level was also identified in a different setting (335). Students praised campus clinics for providing privacy and confidentiality. Students accessing campus clinics had the privilege of accessing services only with their peers. These students' expectations of privacy may therefore be higher than their peers who only use PHCs. It will be important for PHCs to invest in youth zones which are youth dedicated areas at public health facilities.

Provider attitudes

Service provider's attitudes were raised as a concern, for example, students being shamed in front of their peers for a missed appointment. Participants reported that this affected their confidence and self-esteem. Providers, especially at public health facilities, should be trained to provide services in a non-judgmental way. How students are treated as they receive the service matters to them. This will be important to consider as long-acting PrEP products are delivered. The challenge of healthcare provider attitudes is not unique to the South African context but occurs across the sub-Saharan African region [39,40]

Students also reported how providers misinformed them especially about the implant stating that it caused infertility. A similar finding has been reported elsewhere (337,338).

Misinformation limits choices and discourages the initiation or continuation of methods. As more PrEP options are closer to being introduced, it will be important for providers to provide unbiased choice counselling so that young women can choose the method that works better for them and switch where necessary. The training of healthcare providers and ongoing supervision will be essential to ensure that the information provided to young women is accurate. In addition, contraceptive and PrEP counselling should be more responsive to young women's dynamic lives especially their relationship statuses, shifting preferences, values, perceptions, beliefs and experiences as these shape their decision-making compared to biomedical advice (339). Young women's decision-making is therefore shaped by various structural, contextual, interpersonal coupled with the changing values, preferences and needs (339). The provision of both contraceptive and PrEP counselling based on the reproductive justice framework is imperative in order to ensure equitable access to pregnancy prevention and HIV prevention methods for young women.

Students' mobility negatively impacts access to health services and continuity of care. Access to health services was often interrupted during semester breaks as students were sometimes turned away from some health facilities as they needed to have health record booklets different from those used by campus clinics. It is crucial to develop a centralised database and acceptable referral arrangements to ensure continuity of care as students' transition between campus and facilities in their home areas. In South Africa, electronic health systems have been produced by different vendors which have however failed to communicate with each other as they were built using different underlying database architectures (340). While electronic systems have been

implemented in some areas, more than half of public health systems in South Africa were still using paper-based records (340). Attempts have been made to digitize the health system in African countries like Ghana and Malawi failed due to the absence of government support, supporting infrastructure and a reliable electricity supply among other reasons [44-46]. As long-acting PrEP methods become available, it will be necessary for campus and public facilities to accept each other's health records, referrals, and prescriptions to enable mobile patients to still benefit from any PHC. Linking the services will also ensure that students do not mess with their health records trying to copy what is on the campus clinic cards onto the writing books. Also, students will also complete their studies at some point and need to easily fit into the health systems outside the campus; hence, services need to be fully linked while these young women are still students. This will also be important in preparation for the implementation of national health insurance.

Study strengths and limitations

Data were collected using multiple methods including FGDs and IDIs which allowed for triangulation of findings. Young women were very open about their experiences of contraceptive services and discussed their issues openly. Despite the strengths, we recognise the limitations of our study. Firstly, the focus on students in tertiary institutions alone leaves out the views of other young women which are also crucial in informing service delivery. The study also only reported on students' views as we did not interview healthcare providers. Future studies should also look at the views of healthcare providers. In addition, social desirability bias could have affected our findings as we solely relied on students' responses to questions.

Conclusion

Facilitators and barriers to contraceptive use occur at different levels. A multipronged approach is therefore essential to ensure continued use of both PrEP and contraceptive methods. There are striking similarities between the facilitators and barriers to accessing and maintaining contraceptive use and PrEP. As our findings show that there are side effects common to both contraceptives and PrEP use, this offers an opportunity to improve counselling and management of the side effects to promote their effective use. Also, lessons learned from either contraception or PrEP could strengthen both services. As both contraception and PrEP fall under the same umbrella of SRH services, according to UNAIDS reports on targets for 2025, there is a strong case for integrating services. In addition, the challenges experienced by young university students point to a need for health systems to ensure continuity of care through catering for mobile people, such as students who change places where they access contraception during the term, on vacation and when they finally complete their studies and can no longer access the campus clinics.

Recommendations for PrEP

PrEP is being rolled out in many high HIV prevalence settings, particularly in Southern and East Africa which are characterized by a generalized epidemic. There are several recommendations which can be drawn from this study which would be relevant in other settings where PrEP is being rolled out. Firstly, it will be important to invest more in ongoing provider training, especially on the management of side effects. This will address barriers for PrEP use at individual level. Providers should spend more time

discussing potential side effects and prescribing analgesics to manage headaches, if required. In addition, it will be important to offer remedies for nausea to support continued use of PrEP should young women struggle with these side effects. A previous study reported that about 40% of the participants discontinued oral PrEP due to nausea (309). Managing side effects therefore enables continued use of methods. Also, contraceptive and PrEP counselling should be more responsive to young women's lives, relationship status, perceptions, beliefs and embodied experiences as these play a key role in their decision-making.

At a relationship and family level, it will be important to provide PrEP information to partners and parents as they play an essential role in the continued use of contraception. Partners and parents have the potential to play the same key role in PrEP use. Studies conducted elsewhere have reported how male partners played a key role, especially in reminding and encouraging their partners to take PrEP, which enabled continued PrEP use (343,344).

There is also a need to improve the quality of service delivery. Many health-system factors still need to be addressed to improve service delivery. Service provider attitudes remain a crucial barrier to the utilisation of contraceptive services and potentially PrEP services. At the health system levels, more providers need to be trained to provide youth friendly services so they can encourage young women to access services through their positive, non-judgmental attitudes. Providing contraceptives for free does not translate to the uptake of services hence there is need to improve the quality of services.

Waiting times need to be shorter, especially for young women who are studying. This would facilitate continued access to SRH services including, for long-acting PrEP. Long waiting times are a key barrier to client satisfaction and quality of service (317) and need to be addressed through finding innovative ways of shortening waiting times. Opening hours need to be addressed as some students only get time after their classes when some PHCs would have closed already. For continued use of services, it will be important to consider offering services both during weekends and after hours as unfavorable working hours discourage service utilization. Proper stock management will also help gain the trust of young women in the health system.

Since students are a mobile population, it will be crucial to have electronic health records. A centralised database will ensure a smooth transition between different service delivery points. This will likely result in continuation of care as students' transition from their home provinces to the tertiary sites and vice versa so that users do not end up tempering health facility records trying to create a clinic card or booklet acceptable to the facility they are visiting. Also, students will eventually complete their studies, but the need to prevent HIV remains; hence, it is important to integrate the services by creating a centralised database.

Declarations

Competing interests

The authors have declared that no competing interests exist

Funding

PS was supported by the Consortium for Advanced Research Training in Africa (CARTA). CARTA is jointly led by the African Population and Health Research Centre and the University of the Witwatersrand and funded by the Carnegie Corporation of New York (Grant No. G-19-57145), Sida (Grant No:54100113), Uppsala Monitoring Centre, Norwegian Agency for Development Cooperation (Norad), and by the Welcome Trust [reference no. 107768/Z/15/Z] and the UK Foreign, Commonwealth & Development Office, with support from the Developing Excellence in Leadership, Training and Science in Africa (DELTAS Africa) programme. The statements made and views expressed are solely the responsibility of the Fellow. The funders had no role in study design, data collection and analysis, decision to publish, or preparation of the manuscript.

Authors' contributions

PS, NJC and SM conceptualised and designed the study. PS conducted a few interviews, analysed the data, and discussed codes and themes with NJC. PS wrote the manuscript, NJC and SM reviewed the document, amending the content and wording.

Acknowledgements

The authors would like to thank all the participants who made this study possible. Also, we acknowledge the study team’s contributions in data collection and transcription.

Chapter 5: RESULTS (2)

Patience Shamu, Saiqa Mullick and Nicola J Christofides. Perceptions of the attributes of new long-acting HIV Pre-Exposure Prophylaxis formulations compared with a daily, oral dose among South African young women: A qualitative study. *AIDS Care*: **DOI 10.1080/09540121.2024.2383878**

Perceptions of the attributes of new long-acting HIV Pre-Exposure Prophylaxis formulations compared with a daily, oral dose among South African young women: A qualitative study

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Abstract

Oral PrEP is highly effective against the acquisition of HIV but is underutilised by young women. New options, like the monthly dapivirine vaginal ring (DVR) and injectable long-acting cabotegravir (CAB-LA), are emerging. However, little is known about young women's perceptions of these alternatives. This qualitative study explored university students' (18-24 years) perceptions of the attributes of PrEP technologies in South Africa. Young women accessing sexual health services were purposively recruited to participate in five focus group discussions with 40 participants, 22 in-depth interviews and two workshops using the nominal group technique with 22 participants at two tertiary institutions between August 2022 and March 2023. Students were selected because the tertiary environment can increase young women's vulnerability as it brings new sexual freedoms. A thematic approach guided by the Diffusion of Innovation attributes, which include relative advantage, compatibility with the student's lives, complexity of the technology, and trialability, was used for data analysis. While some participants had tried oral PrEP, few were aware of new technologies but expressed willingness to use them. CAB-LA had a relative advantage due to the compatibility of the bi-monthly administration similar to injectable contraceptives. The DVR was the least preferred because of the perceived complexity of inserting it in the vagina and some safety concerns. Oral PrEP, which some had tried and discontinued, was least compatible with students' busy schedules. Integrating PrEP and contraceptives with similar return visit patterns could enhance service delivery. Intensive campaigns are needed to raise awareness and dispel myths about the vaginal ring.

Keywords: young women, sexual and reproductive health, HIV, pre-exposure prophylaxis technologies, good health and well-being

Introduction

HIV prevalence remains high despite decades of implementing HIV prevention interventions. Adolescents and young women (AGYW) [15-24 years] are particularly vulnerable to the acquisition of HIV (345). In South Africa, about a third of new infections are reported among this age group and HIV is mainly transmitted heterosexually (109). There are several challenges with existing HIV prevention methods, such as condoms, medical male circumcision and abstinence, among others. Women often have limited agency to use these methods and voluntary medical circumcision among men has not reached the levels of uptake to protect them from HIV (346,347). Young people generally struggle to consistently and correctly use condoms (348). Power imbalances in sexual relationships limit young women's power in HIV prevention, especially in negotiating condom use (100,349). Pre-exposure prophylaxis (PrEP), therefore, gives young women power over HIV prevention. Currently, available PrEP methods are all ARV-based.

Oral PrEP is highly effective in preventing new HIV infections in South Africa. Its efficacy in clinical trials was over 90% (350). Oral PrEP became available in South Africa in 2016. It was first made available to key populations, such as sex workers and men who have sex with men (309). In 2017, it became available to AGYW, including students at selected tertiary institutions (309). However, despite its availability, young women often struggle to take the daily oral PrEP pill, and the continuation remains low (351). PrEP uptake remains low, estimated at 20% in two implementation studies (352). Long-acting PrEP technologies like the injectable long-acting cabotegravir (CAB-LA) and the monthly dapivirine vaginal ring (DVR) have recently become available through several demonstration studies around the country.

PrEP technologies come in different forms and offer varied levels of protection against HIV. In addition, they have different forms of administration. CAB-LA is an injectable ARV administered bi-monthly, intramuscularly, for people not living with HIV. It is also over 90% effective in preventing HIV infections (353). In the HPTN 084 trial, which looked at the HIV prevention efficacy of CAB-LA compared to oral PrEP, CAB-LA

proved to be superior to oral PrEP, with nine times fewer HIV infections reported among CAB-LA users compared to oral PrEP users (354). DVR is a novel, woman-centred, long-acting HIV prevention method (261). The ring is made of silicon and acts by slowly releasing the ARV, dapivirine. It can be self-administered intravaginally for 28 days, working at the site of potential infection and use can be discreet (261). DVR reduced HIV infection risk by 27% overall and by 56% in women older than 21 years in the ASPIRE study (355). In the Ring study, HIV incidence was reduced by 31% overall and by 37% among women older than 21 years (355). Comparatively, the DVR efficacy is lower than that of CAB-LA and oral PrEP. DVR has received approval from the South Africa Health Products Regulatory Authority (SAHPRA) and is now available through selected study sites. However, little is known about how young women perceive these PrEP products, and perceptions will inform demand-creation activities. We explored young women's preferences and willingness to use these new PrEP technologies.

Accounting for user preferences is crucial in developing new HIV prevention interventions (356). Gathering young people's perceptions on long-acting methods has the potential to increase their acceptability and provides an opportunity to influence product uptake. By soliciting young women's perceptions of the new long-acting PrEP methods, the messaging and provider training can be adapted.

Delivering the different PrEP technologies will require different promotion efforts to increase uptake, and these new products' perceptions can be understood through the diffusion of innovations (DOI) analytic framework. The DOI has been used in fields such as agriculture, social work and public health, especially in nursing, to introduce new practices, policies, interventions or technologies (237,357–360). The attributes include relative advantage, compatibility, complexity, trialability and observability. DOI was also applied in a study that looked at adolescents' perceptions of the attributes of a long-acting reversible contraceptive method (361). The perceptions of the attributes of the innovation, in this case, the new PrEP technologies, influence the adoption rate in a social system (362). We therefore aimed to explore young women's perceptions of the attributes of these new PrEP technologies and how these could influence willingness to use PrEP.

Materials and Methods

We conducted an exploratory, formative qualitative study to explore young women's preferences and willingness to use these new PrEP technologies between August 2022 and March 2023. The new technologies include CAB-LA and DVR.

The study was conducted in the City of Tshwane, Gauteng Province of South Africa. The poverty rate in Tshwane stands at 31.3%, according to the City of Tshwane poverty profiling (363). The selected institutions are in a township where 99.2% of the population comprises Black Africans (364). The area is also highly populated and contains some informal settlements. We purposively selected two tertiary institutions, a university and a Technical and Vocational Education and Training (TVET) college. Both tertiary institutions were mainly government-funded. Mobile clinics frequently visit the two sites providing sexual and reproductive health services (SRH). The SRH services provided included screening for sexually transmitted infections, contraceptive services and oral PrEP for HIV prevention. These services are financed through external donor funding and provided to students free of charge.

Young, sexually active women who had used a contraceptive method and were aged 18 to 24 years were invited to take part in Focus Group Discussions (FGDs), In-Depth Interviews (IDIs) and workshops. Those who had participated in FGDs and consented were later invited to participate in a workshop at two tertiary institutions.

Two trained female field workers recruited 18-24-year-old young women for FGDs, IDIs and workshops. The data collectors explained the aim of the study to the participants at the campus clinic waiting area, the college campus, and the mobile clinics. Also, they provided information about the different PrEP technologies before asking questions. Participants with some experience in using contraceptive methods were purposively selected. They were recruited from the campus clinic waiting area, mobile clinics, and the college campus. Study information was provided to students at the campus clinics and on a college campus, where trained female data collectors addressed students in groups, and those interested volunteered to participate.

All participants were given the demonstration DVR to feel and touch it. In addition, they also viewed a video demonstrating how DVR should be inserted. PS and the two trained data collectors pre-tested the tools. Pre-testing of the interview guides was done to check if participants understood the questions and also to determine the duration of the interviews and the participants' understanding of the questions. An informed consent process was carried out with individuals who expressed an interest in the study. The workshops, IDIs and FGDs were conducted face-to-face in English using semi-structured interview guides. However, participants were allowed to express themselves in their vernacular language if they felt they could explain themselves better that way as the two data collectors conversed in various languages such as isiZulu, Xitsonga, Sepedi, Setswana, isiNdebele and seSotho and could translate them into English. PS collected some of the data. She was a qualitative researcher on a PrEP project at the time, with post-graduate qualifications in social sciences.

On both campuses, IDIs were conducted in a boardroom or outdoors with auditory privacy. A total of twenty-two IDIs were conducted. The IDIs took 30-60 minutes and were audio recorded. During and after IDIs, field workers captured field notes.

The IDI guide covered the following topics: use of contraceptive services, PrEP use, willingness to use new HIV prevention methods and social and community concerns. Probes were used where necessary.

Recruitment of participants for FGDs was done through similar places described in IDIs. Five FGDs with 6-10 participants were scheduled around student availability. Students interested in participating in FGDs approached the field workers to provide details of their availability. The FGDs took 1.5- 2 hours and were audio recorded. The note taker for each FGD captured notes during and after the interview discussion. The FGD guide was similar to the IDI guide.

Workshop participants were recruited during FGDs. This was done by asking participants if they would be willing to be contacted in future to participate in a workshop. Only those who consented to be contacted again were invited to attend the workshop. We conducted one workshop at each tertiary institution using a nominal group technique, with nine participants at the TVET college and 13 at the university site.

The purpose of the workshop was to generate service attributes that were important to participants and to prioritise them. We started each workshop by explaining its purpose to the whole group then we later divided the participants into 2 groups for the 9 participants and 3 groups for the thirteen participants. The guiding questions for the groups included: how they would like to access long-acting PrEP methods and this covered the preferred place of delivery; how they prefer to get information, the acceptable costs, among other attributes. Participants shared their perceptions of CAB-LA and DVR in the workshops, including their willingness to use the products when they became available. Similar to the IDIs and FGDs, we audio-recorded the workshops, which they ran for 1.5-2 hours. The note taker also captured notes during and after the workshop.

This study was approved by the University of the Witwatersrand [protocol number: M211133]. Participants also provided written consent. Further study permissions were obtained from the institutions' management authorities to conduct the study on the two institutions' campuses. Participants received USD2.90 as reimbursement for the time they spent in the study.

Data Analysis

All audio recordings were transcribed verbatim. To ensure good quality control, two field workers checked all transcripts. They swapped transcripts for a second round of quality checks before sending the documents to the researcher for final checking. NVivo 12 software (QSR International) was used for coding. We used a thematic approach to data analysis and used the relevant attributes of the DOI to organise the themes, including other themes that were identified from the data. Deductive codes were applied as study objectives, and literature informed them. The DOI was kept in mind as these codes were generated. Inductive codes were also applied through repeated reading of the transcripts. We also identified sub-themes, such as the frequency and mode of administration of PrEP technology. PS coded the transcripts and discussed codes with NJC until an agreement was reached.

Findings

A total of 22 young women participated in IDIs and 40 in FGDs, with 22 of these participating in the workshop as well. The mean age of participants was 21. Most of the IDI participants were using injectable contraceptives that are either Nur-Isterate [32%] administered bi-monthly or Depo Provera [32%] administered every 3 months; 18% were on oral contraception; 14% had discontinued contraception while the rest were other methods. Only a few of the participants had ever used oral PrEP. Most of the university students stayed on campus while the college students rented off-campus accommodation in the township where the vocational college was based, as it did not offer any accommodation.

To understand students' preferences and willingness to use LA-PrEP methods, we organised our themes using the attributes of DOI. The themes were divided into relative advantage, compatibility with the students' lifestyles, complexity of the PrEP technology, and trialability and observability of the PrEP method. These attributes of DOI are depicted in Table 5.1.

Table 1: PrEP innovation attributes and the associated explanations for each attribute

Attribute	**Explanation**
Relative Advantage	The extent to which one form of PrEP is perceived to be better than the other.
Compatibility	The extent to which one form of PrEP is perceived to be consistent with female students' preferences, values, experiences and beliefs.
Complexity	The extent to which the PrEP form is perceived to be difficult to understand or use
Trialability	The extent to which a PrEP technology can be experimented with on a limited basis.
Observability	The extent to which the use of long-acting PrEP produces tangible results [staying HIV-negative]

The sub-themes included the PrEP method's frequency, mode of administration, familiarity with administrative mode, perceived pain, perceived ease of use, and visibility of the method. Students generally preferred CAB-LA, while DVR was the least preferred due to an unfamiliar administration mode and a lower efficacy. Some students reported that they did not need to try something with less than 50% effectiveness.

… what's the use of using it if it's not gonna protect me? That's risky, I'm just. I'm still putting myself at risk, so what's the use of using something that's gonna protect you only 50%? [IDI 01-01-13, 19 years].

Relative advantage

The PrEP intervention's relative advantage was the degree to which the type of PrEP was perceived as better than the current idea or practice (238). Most students highlighted that injectable PrEP had a relative advantage over oral PrEP. DVR was also viewed to have advantages over the daily oral pill. The advantages were in the frequency of administration, trust in the mode of administration and discreet use.

Frequency of administration

Taking a daily pill was difficult for those students who had tried to take oral PrEP. Some participants compared taking oral PrEP to taking antiretroviral drugs due to its frequency of administration. Most participants perceived the DVR and CAB-LA to have a relative advantage over oral PrEP due to their frequency of administration. Students preferred the bi-monthly administration of CAB-LA because they did not need to think about it after getting the injection until the next return visit to the clinic. A student explained how she would prefer to use CAB-LA, "*because it's once in a while and we already on contraceptives like Nur-isterate, so we're used to being injected. It won't be a problem*. [P23, FGD01-01-03]. Students highlighted that they enjoyed taking a while before coming back to the health facility. A student explained, *"*Will use that method cause[because] will take time before we inject …., unlike this PrEP of taking a pill every day." [P18, FGD 01-01-01].

Having a clear routine of method administration was important for some young women, and this influenced their preference for using certain methods over others. DVR was viewed as having this advantage as there is a set date for its administration which the participant perceives as helpful in preparing her mind for it. "I know that I've got a set date, my mind is prepared for it." [IDI 03-01-05, 20years]**.** In addition, getting DVR for a month was also perceived to instil a sense of safety compared to taking the daily oral PrEP.

Some students thought the DVR or CAB-LA could be a solution for those who might not remember to take their pills every day. The DVR was also perceived to be a better option, especially for participants who were not happy with taking a daily pill, fearing that they might forget to take the pill. While some participants perceived the CAB-LA to be an option for them because they would forget to take the pill, a participant explained, "because I feel like sometimes, I will forget, so, I prefer injection [IDI 01-01-05, 22 years]**,** others opted for DVR as they had used injectable methods before for contraception. A participant explained,

I will prefer the, the ring one because I think for pills sometimes I am a person I might forget to drink these pills which will put me in risk, yes so injection yoh! [exclamation], I no longer want injections. But a ring, I think, is a solution for me…I think the ring is ten out of ten [IDI 01-01-03, 21 years]

A method suitable for past PrEP users

DVR was also considered to be a preferred choice for past PrEP users who had discontinued oral PrEP. For those participants who once tried oral PrEP but would forget to take it as required, DVR would then be an alternative PrEP technology.

Ok. I think I think like the ring it would be perfect for me to use it because like. Uh, using PrEP like for didn't work out for me, and then yeah. And then, you know, sometimes, like Ok. We can get raped, like the person would not like to use condoms, yeah. [IDI 03-01-01, 21 years].

Disadvantages of long-acting methods

There were a couple of participants who did not see an injection (CAB-LA) as having an advantage over other modes of administration as they were scared of taking an injection, which they believed was painful. One such participant explained how she was not willing to take an injection because of perceived pain: "Because the injection like uhm…is painful, that's why, I am afraid of it" **[**IDI 03-01-07, 22 years]**.** The perceived pain associated with the method, therefore, influenced the young women's willingness to use the PrEP methods. Some participants also expressed their unwillingness to use injectable PrEP due to perceived allergies to injections. A participant explained why she

would not prefer injections and said, “No, I'm allergic to injections” [IDI 03-01-01, 21 years].

One of the disadvantages of using DVR was the perceived discomfort of inserting it: “Imagine opening up my vagina and inserting it. I’m pretty sure I’m going to feel something; I’m going to feel pain” [IDI 03-01-04, 20 years]

Discreet use of long-acting methods

Another advantage of CAB-LA and DVR was that they could be used discreetly. Discretion of method also contributed to students’ willingness to use the PrEP method. The long-acting methods also came with convenience as CAB-LA does not need to be carried around, unlike oral PrEP pills. Students highlighted that they would be comfortable with taking long-acting methods and would be able to go anywhere they could think of as the method was invisible.

Yes, then the injection, rather than,,,the pill. All because, uhm…at least a person is comfortable like you can just go anywhere and nobody knowing even like, just like, it’s invisible, rather than the pills. [IDI 01-01-12, 22 years].

Trust in the injection

The injection mode of administration was trusted compared to the other PrEP technologies. Some participants believed that there was nothing that they could do which would disturb CAB-LA. A participant explained,

With the pill for example, you cannot drink alcohol and stuff so, I don’t know if it’s true but then I feel like taking a pill can be an inconvenience a bit, than the injection because you’re taking a pill every day…. So, there’s not much you can do cause…like it’s an injection…it’s inside. There’s nothing you can do which can disturb, I believe, there’s nothing you can do which can disturb it. So, I think it’s better. [P4, Workshop-U]

Compatibility

Compatibility was used to describe the degree to which the long-acting PrEP method is perceived as consistent with the individual’s existing values, beliefs, past

experiences and needs (238). CAB-LA was perceived to be consistent with students' lifestyles in terms of their current contraceptive use, as most participants reported using injectable contraception. Compatibility with new long-acting PrEP methods was described in terms of familiarity with the mode and frequency of administration. Students explained how they were already using injectable contraceptives, which they were getting mostly every two months; hence, they were already used to being injected. A student said, "*because it's a once in a while, and we already on contraceptives like Nuristerate, so we're used to being injected. It won't be a problem*." [P23, FGD01-01-03]

CAB-LA's frequency of administration was perceived to be compatible with students' lifestyles as they were also taking injectable contraceptives with a similar frequency of administration. Students also expressed willingness to use DVR, arguing that it did not have many administrative requirements. Because of the frequency of administration, it was also likened to having a monthly period.

I think the ring because it doesn't have too much admin, like, and I, I would only have to take it out once the month ends and put on another one, It's the same thing as going on your period [IDI 03-01-05, 20 years]

In the workshop, in smaller groups, students generally agreed that CAB-LA was more compatible with their lifestyles compared to oral PrEP. Reporting back to a bigger group a participant said,

So we all chose injections neh, [right]and then our reasons were, me personally I chose the injection because it's fast like when I go to the clinic like I, I, like I get out just within ten minutes or so, and then others chose the injection because, because it stays in the system for a longer period, and then again, okay because also is a once off thing, unlike pills, like you drink them each and every single day, and we know that we are students and we are lazy to drink pills especially those who go to campus, just imagine you have to drink a pill at eight o'clock and you are not at the campus, I mean at the res [residence], yes, so the injection is better, is better for all of us I think.. [P29, workshop UG5]

Unlike oral PrEP, CAB-LA was also compatible with students' lifestyles. A participant explained how young women enjoy going out to have fun, which could make it difficult for them to stick to a daily routine of taking oral PrEP.

Yes, because with students, we are kind of wild, we go out, we don't have time, imagine if I were to be at Short Left maybe. Short Left is this other club that we usually go to, so imagine if I'm taking PrEP and then we are going to the Groove at seven and, I told myself that I'm going to take PrEP every like every day at seven you see so that means I'm not going to take PrEP by the time because I'm not around, we are so wild as students [P16, FGD03-01-01]

Not having regular access to food made it difficult for some participants to use daily oral PrEP. A participant spoke of the difficulty of taking daily oral PrEP, explaining that she does not eat on certain days. Oral PrEP pills were then not compatible with her lifestyle. A participant said, "you can't drink pills without eating food, so sometimes I go a day without eating" [P17, FGD 01-01-01]

Another participant argued that she could not choose an oral PrEP method as she was taking many other medications; hence, she needed a method with a different form of administration. She said, "*Already I am sick, meaning I take a lot of medicines, so taking uhm…PrEP I feel like it's going to add more pressure on me for my side, yes*." [P21, FGD 01-01-03].

Lack of familiarity with a method made some students not prefer some PrEP technologies. Some students thought they would not be able to use DVR as they have never used tampons because they perceive them to be uncomfortable. A participant highlighted that, "I have never ever used tampons because I don't think they are comfortable so is that ring" [P26, FGD 01-01-03]. Another participant explained her thoughts on how DVR could be an option for young women who have used tampons before. "the girls that maybe use tampons when they're on their periods like probably it will be easy for them" [P29, FGD 01-01-03]

In addition, some students explained how familiarisation with the mode of administration made them more likely to choose a PrEP method with a similar mode of

administration. Explaining why CAB-LA would be her preferred option, a participant explained,

… and we are young girls who are taking contraceptives, uhm…I think it will be easy for us to inject because uhm…we are used to… [P17, FGD03-01-01]

Complexity

The complexity of the technology describes the degree to which a PrEP method is perceived as difficult to understand or use (238). Complexity included aspects mainly related to the DVR mode of administration, such as concerns over safety and the ring size. Other reasons students cited for thinking PrEP was difficult to use included the fear of missing appointments, dislike of the method, frequency of administration, and side effects.

Some participants thought they would not be able to use DVR, citing that they did not think it would be easy to administer, considering that it comes in one size.

Have you ever worn a tampon that's not your size, because there are sizes, there are smaller ones, yeah, or wearing a tampon, then when its full, have you ever seen how it feels, yoh I can imagine just… [P23, FGD01-01-03]

Other participants were also concerned with the size of the oral PrEP pill. They thought it was too big for them to swallow it. A participant said,

"The pill is huge, compared to the one of Triphasil so it's huge to swallow." [IDI 03-01-04,20 years old].

Other participants feared that DVR would slip in and make it difficult to take out.

I'm scared that it will slip and go all the way in" [P27, FGD 01-01-03].

".. but if I have to put it myself, I would make mistake or put it, maybe I would put it uhm…deep, deep, deep, deep, deep then it would be difficult for it to come out] [laughs] it becomes difficult for it to come out and I would have a problem. [IDI 03-01-09, 21 years]

Some participants thought that health professionals should administer the ring to avoid its disappearance. One participant explained, “I prefer that this thing must be inserted at the clinic, not for me to do it myself” [P7, FGD 03-01-01]. Some participants compared DVR to CAB-LA and the implant, as both methods are administered by health administrators**.**

Participants also feared they might be unable to correctly follow the instructions. *I think maybe you are going to do it wrongly, maybe you didn’t get the instructions right, and then you will be going to do what what or something, but the implant you’re going to get it from the clinic and the injections, yeah* [IDI 01-01-01, 23 years]

Other participants added that they wanted someone to blame should anything go wrong. Providers could be blamed if something goes wrong with the injection, for example. “If it’s being administered by the nurses, that way you will have someone to blame and go back to her” [P5, FGD03-01-01]

Oral PrEP Frequency of administration

Some participants also explained the complexity of using oral PrEP. This was seen in taking a daily pill which was likened to taking HIV treatment daily. A participant explained, “It’s like you are drinking a pill to prevent yourself from drinking a pill” [P11, FGD 01-01-01]

Trialability

This describes the degree to which a technology, in this case PrEP, can be experimented with on a limited basis (238). The participants’ willingness to try new PrEP technologies seemed to be influenced by the product’s mode and the frequency of administration. All methods could be tried and then discontinued. The DVR could be removed immediately. There was some hesitation about even trying some of the methods. Compared to other PrEP technologies, trying out DVR was considered a bigger challenge as the way it should be administered was not only perceived as uncomfortable but also as painful. Some participants reported that trying out CAB-LA would be difficult

at first, but they were still open to trying it. A participant likened the hesitation to try out CAB-LA to the COVID-19 vaccine hesitancy,

I think this injection thing, when you start it will be hard for students to adapt, but it's the same as the COVID-19 injection we didn't want to vaccinate like most of us, but we finally vaccinated so it will be the same, at first we are not going to accept the injection and stuff but when time goes, almost everyone will, what, what is needed is maybe people who are nurses to educate about this. [P18, FGD 01-01-01].

Only a few participants were willing to try oral PrEP due to pill burden. Some participants likened the daily taking of pills to taking ARV pills which are also administered daily,

I have a problem with drinking PrEP every day that means I'm similar to someone who is taking HIV pills, so I think the implementation of six months' injection and what not it's going to be very helpful [P16, FGD01-01-01]

Discussion

Participants generally preferred CAB-LA over daily oral PrEP and were sceptical about using DVR. While a few participants perceived that the injection may be painful, most were still willing to use it as it was compatible with their lifestyles. Some participants were also used to getting injectable contraceptives every 2 months. A household survey conducted in South Africa found that the majority of women were using injectable contraceptives (79). Injectables are, therefore, a familiar mode of administration, hence the general preference for CAB-LA over other PrEP technologies.

Using the DOI attributes, we found that CAB-LA administered every 2 months had a relative advantage over oral PrEP, which has to be taken daily. CAB-LA was generally compatible with students' lifestyles; however, with the return visits for injectable contraceptives. The DVR's perceived complexity made it the least preferred PrEP technology among the students. The observability of the results of using PrEP was, however, a challenge in this study, as proving that someone had remained HIV-negative after using PrEP was difficult as it could not be easily observed by one's peers. However,

in one study, this was inferred from HIV testing results where participants shared experiences of their friends and sexual partners who were using PrEP and not using condoms but remaining negative for HIV as confirmed through testing (365).

Generally, the students expressed willingness to use CAB-LA mainly because of its relative advantage over oral PrEP. The relative advantage seemed to be in the frequency of administration, which would be every two months, which was also compatible with students' lifestyles. Young women generally seem to prefer methods which are not administered regularly, as taking a daily pill was seen to be a burden. This finding is supported by another study conducted among young people in South Africa, where daily pill-taking was also seen as a burden (366). However, contrary to these findings, a study conducted in South Africa, Zimbabwe and Uganda reported that some young people found it easy to take pills, and they found them easy to carry around and easy to swallow (348). Although these young women found pills easy to swallow, studies have reported that most young people discontinue taking pills within the first month of initiating PrEP (367). In a different study, participants showed a general preference for long-acting methods such as CAB-LA due to better adherence and a dislike of pills (3). Long-acting products are therefore needed to ensure sustained use of PrEP. This also emphasises the need for PrEP choice, as one size will not fit all.

CAB-LA was also perceived to be compatible with students' lifestyles. The compatibility seemed to have stemmed from the students' familiarity with injectable contraceptive methods as the most commonly used method in the country. Perceptions of ease of product use are often influenced by familiarity with the product and ultimately influence product acceptability (348). In addition, CAB-LA mode and forms of administration were perceived to be compatible with students' lifestyles of randomly going out to have fun with their friends, sometimes with no time to pack oral PrEP pills. Long-acting methods would, therefore, prepare young people for outings they would not have prepared for. Some of the outings result in heavy use of alcohol. Alcohol consumption could compromise one's ability to remember to take daily PrEP (368,369). Studies conducted among students in tertiary institutions have reported how heavy use of alcohol could lead students to engage in risky sexual practices, making them

vulnerable to HIV (370,371). The discreetness of long-acting PrEP would help young people deal with the stigma attached to carrying around, including the use of oral PrEP pills and ultimately reducing HIV risk. Long-acting PrEP methods were, therefore, generally perceived to be more compatible with students' lifestyles.

Stigma seemed to be a challenge among students. This challenge is not, however, unique to the student population. Previous studies have reported on the stigma attached to taking PrEP pills (372,373). Some students explained that the PrEP pills looked like ARV pills; hence, if one were taking them, then their peers would suspect that they were on HIV treatment. Changing how the PrEP pill looks could make it more acceptable. Addressing stigma would also make the pills more acceptable, which will help in the expansion of choices. Also, reducing the size of the PrEP pill may make it more acceptable to young women.

While participants reported a general preference for injectable PrEP, some highlighted that injections were not an option for them. This was either due to fear of injections or previous allergic reactions. A fear of needles was also reported as one of the concerns with injectable PrEP (374). Therefore, there is a need to offer alternatives as user preferences vary across populations. Offering alternative PrEP choices will help ensure that more women are covered by a PrEP method of their choice.

The complexity of using different PrEP technology placed DVR at a disadvantage in addition to the low efficacy. Some young women were not willing to try DVR because it would be inserted inside their bodies, and they felt unsafe. A similar finding has also been reported in another study where women were opposed to products which are inserted in the vagina due to the perceived discomfort and concerns about fertility and cancers (348). The other complexity of the method stemmed from self-administration. While in this study, young women did not feel skilled enough to insert DVR properly and trusted the providers to do it for them. Women could be provided an opportunity to practice inserting the DVR themselves in a private space in the clinic. Clinic administration whether by a provider, or the woman herself, was favoured as it would spare participants from having to hide the products from their partners (348). How the

products were administered influenced the young women's willingness to use PrEP methods.

While self-administration of DVR could offer more privacy to young women and reduce pressure on healthcare providers, the students still seemed to trust the products trained providers administer. Young women seemed to want someone to hold responsible and return to them should anything go wrong with the PrEP technology. Examples of contraceptive injectables and implants, which trained providers administer, were then given. To allay this fear, as the PrEP products become available, initially, service providers may need to either insert the DVR for individuals who need the support or guide them on how to do it. This may see more young women opting to use DVR. Young women, therefore, seem to have confidence in the skills of trained healthcare providers. This confidence they have in the providers can then be harnessed to support initial product use until the young women have gained trust in the products.

While most students did not express willingness to use DVR, most likely due to its low efficacy, this PrEP technology seemed to be an alternative for young women who have used oral PrEP before and stopped. This could imply that these young women were eager to prevent HIV but could not deal with the daily pill burden. Also, DVR was perceived to be an option for young women who have used tampons before, as these were perceived to be familiar with the mode of administration. Demand generation for DVR would, however, need to address this misconception. Previous studies have highlighted familiarity with the mode of administration as one of the important components influencing preferences for PrEP (366,374). An earlier study on HIV PrEP preferences conducted among young adult African American MSM showed that most participants chose oral PrEP due to familiarity with taking oral pills as a standard medication delivery modality (374). In another study conducted among young women, taking pills was considered to be easy. However, contrary to these findings, our study found that some participants said they would choose a different PrEP method as they were also taking other medications orally; hence, a method with a different mode of administration would work better for them. Recent studies have, however, reported that most young people discontinue PrEP due to side effects and pill burden (323).

Therefore, there is a need for health providers to offer many choices so that there is a method to cater for young women's circumstances as individuals.

The study had some limitations. A few of the study participants had used oral PrEP. At the time of data collection, DVR and CAB-LA were unavailable, so participants discussed hypothetical preferences without having tried the methods. While all participants touched and felt the DVR, none had used CAB-LA. Future studies should capture the views of participants who have used the actual products. Participants who selected CAB-LA may not have properly understood that they would still need to take oral PrEP if they decided to discontinue using it, as this was not explained to them. Given some of the resistance expressed to taking pills on a daily basis that we found in this study, the important message about needing to take oral PrEP for a limited period of time when discontinuing would need to be integrated into counselling sessions prior to initiation onto CAB-LA. The study was also conducted among young women in tertiary institutions in one district of South Africa, and their perceptions of long-acting PrEP methods and their transferability to other contexts in South Africa may be limited.

Conclusion

Students showed a general preference for CAB-LA over oral PrEP and DVR. CAB-LA administration was compatible with students' patterns of injectable contraceptive use. Offering contraceptives and PrEP with similar patterns of return visits provides an opportunity to integrate sexual and reproductive health services. Since all the PrEP methods have advantages and drawbacks, promoting choice is necessary, as one size will not fit all. Some students, although few, liked the idea of being able to remove or stop oral PrEP immediately. The stigma around the oral PrEP pill, however, still needs to be addressed through educating communities on the different PrEP methods. PrEP is a viable strategy in South Africa, although pills are not the preferred mode of delivery. Also, providers will need to be trained to promote informed choice counselling so they spend enough time discussing the different PrEP methods and their advantages and drawbacks to enable young women to make informed decisions about a method that fits into their lifestyle. In addition, considering that DVR is generally perceived to be a complicated PrEP technology, thereby reducing its trialability among young women, it is

necessary to debunk the myths around it, especially among young women, by providing detailed information to increase its acceptability. Also, demand creation must be intensified to create PrEP awareness among young women.

Acknowledgements

Thank you to all the students who participated in this research. We would like to acknowledge the data collectors who worked diligently throughout the data collection process.

Disclosure Statement

There is no conflict of interest to declare.

Additional Information

Funding

This research was supported by the Consortium for Advanced Research Training in Africa (CARTA). CARTA is jointly led by the African Population and Health Research Center and the University of the Witwatersrand and funded by the Carnegie Corporation of New York (Grant No. G-19-57145), Sida (Grant No:54100113), Uppsala Monitoring Center, Norwegian Agency for Development Cooperation (Norad), and by the Welcome Trust [reference no. 107768/Z/15/Z] and the UK Foreign, Commonwealth & Development Office, with support from the Developing Excellence in Leadership, Training and Science in Africa (DELTAS Africa) programme. The statements made and views expressed are solely the responsibility of the Fellow

Chapter 6: RESULTS (3)

Patience Shamu, Saiqa Mullick and Nicola J. Christofides. Service delivery characteristics preferences and trade-offs for long-acting injectable pre-exposure prophylaxis among female students in tertiary Institutions in South Africa: A Discrete Choice Experiment. *Global Public Health*: **DOI 10.1080/17441692.2025.2489710**

Service delivery characteristics preferences and trade-offs for long-acting injectable pre-exposure prophylaxis among female students in tertiary institutions in South Africa: A Discrete Choice Experiment

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Abstract

High HIV incidence among young women (18-24 years) continues to be a public health concern in South Africa. Although there are many freely available HIV prevention options, especially through the public health care system, most of the methods, like condoms, are male-controlled, and young women struggle to negotiate for their use (107,375). The use of antiretroviral drugs for HIV prevention, such as pre-exposure prophylaxis (PrEP), is highly effective and gives women more control over HIV prevention (376). Oral PrEP became available in South Africa in 2016 (309). A phased approach to oral PrEP introduction was used in South Africa, and it first became available in 2016. It was first introduced to key populations such as sex workers and men who have sex with men and later on to students at selected tertiary institutes in 2017 (309). However, the daily administration of oral PrEP is a burden to many young people (322). PrEP uptake remains low and has been described as inadequate to meaningfully contribute towards ending the epidemic (377,378). The UNAIDS target of 3 million PrEP users by 2020 was missed, as only a third of this had been achieved by 2020 (4,379).

Oral pre-exposure prophylaxis (PrEP) for HIV prevention promises women more control over HIV prevention. To alleviate low PrEP uptake, rolling out long-acting PrEP methods could increase uptake in women's preferred ways. The study sought to determine injectable PrEP service delivery characteristics that effectively meet young women's service needs. In 2023, we conducted a discrete choice experiment in South African tertiary institutions. We recruited and interviewed 400 female students mostly queuing for sexual health services. Data were analysed using mixed logit and latent class models. Women strongly prefer using campus clinics to non-campus clinics and returning to the facility for product information and its side effects to using a chatbot [OR =1.07, CI: 1.02, 1.13]. Also, compared to getting a free service, students were prepared to pay R50 ($2.90) [OR=1.14, CI: 1.05, 1.25]. Three classes emerged from the latent class model and these differed by background characteristics like age group and study year. Receiving PrEP through campus services from sensitive, PrEP providers and providing accurate information on side effects was preferred by students over community-based primary health care clinics with public health nurses. PrEP-trained providers should provide PrEP services as young people prefer returning to facilities for further youth-friendly support.

Keywords: Pre-exposure prophylaxis, good health and well-being, service delivery, young women, and HIV

Introduction

High HIV incidence among young women (18-24 years) continues to be a public health concern in South Africa. Although there are many freely available HIV prevention options, especially through the public health care system, most of the methods, like condoms, are male-controlled, and young women struggle to negotiate for their use (107,375). The use of antiretroviral drugs for HIV prevention, such as pre-exposure prophylaxis (PrEP), is highly effective and gives women more control over HIV prevention (376). Oral PrEP became available in South Africa in 2016 (309). A phased approach to oral PrEP introduction was used in South Africa. It was first introduced to key populations such as sex workers and men who have sex with men and later on to students at selected tertiary institutes in 2017 (309). However, the daily administration of oral PrEP is a burden to many young people (322). PrEP uptake remains low and has been described as inadequate to meaningfully contribute towards ending the epidemic (377,378), and the UNAIDS target of 3 million PrEP users by 2020 was missed (*UNAIDS*, n.d.).

Long-acting PrEP methods, including cabotegravir (CAB-LA), dapivirine vaginal ring (DVR) and the injectable lenacapavir, can solve the daily pill adherence challenges, as these methods are administered bimonthly, monthly and biannually respectively. CAB-LA and DVR have both been approved by the South African Health Products Regulatory Association, while lenacapavir is still in phase three clinical trials (*NIH*, n.d.). In the HPTN 084 clinical trial, CAB-LA resulted in resulted in a 90% relative reduction in HIV risk compared to oral PrEP (354).

User preferences continue to be an important part of service delivery and understanding the needs of end-users can help to overcome barriers to service utilisation. Barriers to sexual and reproductive health services and rights (SRHR) services utilisation reported among young women include long waiting times, unfriendly health providers, prohibitive transport costs, and long travelling distances (381). Differentiated service delivery (DSD) is crucial to overcome these barriers as it is about tailoring care to meet clients' unique needs (382). In HIV treatment, DSD with varied locations, providers, timing and frequency have been shown to enhance efficiency in HIV care (383). A similar

benefit could be reaped in PrEP for HIV prevention. To successfully implement informed DSD which enables successful service introduction and sustained use, an understanding of clients' preferences is necessary.

The World Health Organization (WHO) outlines four DSD elements: who provides the service (provider), where (location), what (service package) and when the service is provided (frequency) (94). DSD aims to simplify services by reducing the frequency of administration, de-medicalise, and task shift, including the use of virtual platforms, such as mHealth and mobile applications, and integrated services (384). A scoping review that examined oral PrEP service delivery broadly covered four elements, some of which overlap with the WHO DSD components. These were the delivery setting, healthcare providers, target population and delivery channel (190). The delivery setting refers to the places where the service is delivered, such as clinics (385) while the health care providers include nurses and specialist physicians (190,386). The WHO DSD elements, scoping review and formative qualitative research guided the identification of service delivery attributes for the DCE reported in this paper.

Studies focussing on PrEP service delivery have examined attributes such as preferred delivery locations such as clinics and pharmacies close to where people live (387,388). Also, the youth friendliness of clinics has been assessed (389). Offering additional services including getting contraceptives, pregnancy tests and pap smears, among other services has been reported (388). During workshops conducted as part of the formative qualitative phase of this study, participants showed a general preference for long-acting injectable PrEP compared to DVR and oral PrEP as it was perceived to be more compatible with their lives as students (253). This study, therefore, focuses on service delivery characteristics for long-acting CAB-LA.

Before long-acting injectable PrEP becomes available, it will be important to investigate the participants' willingness to trade certain attribute levels over others and to determine the strength of their preferences. While studies have shown that young women prefer long-acting injectable PrEP, little is known about the attributes of service delivery which attract young women to take up this option.

Methods

Study Design

We used a discrete choice experiment (DCE) to collect data. A DCE is a quantitative, stated preference method of data collection. We opted for a DCE so we could calculate the trade-offs young women are prepared to take when choosing a long-acting injectable PrEP service.

Study Setting

The study was conducted in the Tshwane District of the Gauteng province of South Africa between September and October 2023. The district forms part of the She Conquers high-priority districts which provide comprehensive sexual and reproductive health services (390). She Conquers is a multi-sectoral South African government-driven national campaign aiming to reduce new HIV infections in girls and young women, reduce teenage pregnancies, keep girls in school until completion of high school, reduce sexual and gender-based violence, and expand economic opportunities for young people (391). A university and a Technical and Vocational Education and Training college that were close to each other in the district were conveniently selected. Both facilities were serviced through mobile clinics providing SRHR services including contraception and oral PrEP. The services were freely offered to students through mobile donor-funded services.

Sampling and Recruitment

A convenience sample was utilised. Young women aged 18-24 years who were students at the selected sites and had experience of using contraceptive methods or sexually active were recruited from the campus clinic waiting areas, mobile clinics and from the college campus. The data collectors explained the details of the study to potential participants in groups in campus clinic waiting areas, mobile clinics and on the college premises. Those interested in participating who met the inclusion criteria then approached data collectors, underwent the consenting process, and voluntarily participated in the study.

Development of DCE Instrument

Formative qualitative work was used to inform the DCE design. Through Focus Group Discussions (FGDs) and workshops, we identified attributes and levels of long-acting PrEP service delivery through the Nominal Group technique (NGT). NGT is a consensus method used to generate ideas concerning the delivery of long-acting PrEP (392). Trained female data collectors conducted five FGDs with 6-10 participants per group and two workshops in English with 22 participants at both sites using semi-structured interview guides (Shamu et al. under review). After the FGDs, participants were invited to a workshop where they provided input on long-acting PrEP. Participants broke into small groups to discuss service attributes they wanted in the delivery of PrEP. Each group ranked the attributes, and then the groups presented back to the larger group, and a final ranking was reached through consensus.

The priorities identified through the NGT informed the DCE. The final seven attributes for the delivery of long-acting injectable PrEP used in the study were informed by the literature (387,388) and the formative qualitative component of the study. The seven attributes as depicted in Table 6.1, included: how frequently the participants would be willing to go back to the facility to get injectable PrEP; how participants should be assisted between appointments; the location of the PrEP service; cost of the service; skills of the provider in the facility; provider sensitivity and waiting time at the facility.

Table: Identified attributes of injectable PrEP service delivery and their levels

Attributes of the delivery of injectable PrEP	**Levels**
How frequently you would go back to the health facility to get injectable PrEP?	(i) 2 months (ii) 6 months
How you would be assisted should you have questions between appointments?	(i) An interactive App (Chatbot) (ii) A health care provider
The location of this PrEP service	(i) Onsite campus clinic (ii) Public clinic
The cost of this service	(i) Free (ii) R50 [USD2.9] (iii) R100 [USD 5.8] (iv) R150 [USD8.7]

The skills of the provider in the facility	(i) Providers who specialise in PrEP (ii) Provider who is not a PrEP specialist
The Providers' sensitivity	(i) Good listeners (ii) Not good listeners
Waiting time at this facility	(i) 30 minutes (ii) 1 hour

We used a Bayesian efficient design for the final experimental design. A full factorial design would yield 256 alternatives (2x2x2x4x2x2x2). However, 256 choice sets would cause participant fatigue; hence, we designed the DCE using Hole's D-efficient design (*Hole A. DCREATE: Stata Module to Create Efficient Designs for Discrete Choice Experiments; 2017 - Google Search*, n.d.). For the pilot phase where 30 students participated, 15 per site, we used zeros as priors. Using the Bayesian efficient design for a Multinomial logit, 16 choice sets were created. Each participant was then presented with 16 choice sets and had to choose between services A and B as alternatives for service delivery. The DCE design was unlabelled. We also had a third alternative for opting out. The opt-out option was included to simulate a real-life scenario (393) where consumers make choices and may sometimes not choose any of the provided options. To aid the cognitive processing of the different options, we included images of each attribute level (2). All the attributes used in the design were categorical and dummy-coded. For the sample size calculation for this study, a recommendation from Orme was taken whereby a minimum sample of 200 participants per group is needed where group comparisons are being made and 300 where there are no comparisons (305) hence the minimum sample size was, therefore, 300. A total of 6 400 choice tasks were yielded from 400 participants.

Procedures and data collection

Trained data collectors administered the questionnaire in English, and each interview took about 45 minutes. An example of completing the choice tasks was also included to ensure that the participants understood the instructions. Data collectors administered the study tool in English using password-protected computer tablets which only the study team had access to. Study participants received R50 (USD2.90) for the time inconvenience. Study data were collected and managed using Research Electronic Data Capture (REDCap) tools hosted at the University of the Witwatersrand

(394,395). REDCap is a secure, web-based software that supports data capture for research studies (394).

Variables collected under background characteristics

We collected socio-demographic characteristics including age in years, the year they were currently studying, relationship status, and whether they were sharing accommodation with others or not. Also, we asked questions on sexual behaviour, such as having sex without condoms or under the influence of alcohol in the past three months.

Data Analysis

Participants' demographics and background characteristics were described using descriptive statistics. The DCE results were analysed using regression models, specifically the multinomial logit model (MNL) and the mixed logit model (MXL) which are anchored on the random utility theory (RUT). Since the study had two service options, and an opt-out option, the workhorse for the data analysis then was the MNL (288). MXL can approximate any random utility model as it is highly flexible (396). The RUT assumes that utility (U_{jn}) can be derived from a service with a deterministic and a random component. The deterministic component (V_{jn}) is a vector of service delivery attributes observed by the researcher and their marginal utilities, while the random component comprises the error in the regression specification that the researcher cannot explain (397,398). Equation 1 simplifies how the utility of each alternative is a linear function of both an observable and an unobservable component (ε_{jn}).

$$U_{jn} = (\beta_{frequency}*V_{jn\ frequency}) + (\beta_{support}*V_{jn\ support}) + (\beta_{location}*V_{jn\ location}) + (\beta_{cost}*V_{jn\ cost}) + (\beta_{skills}*V_{jn\ skills}) + (\beta_{sensitivity}*V_{jn\ sensitivity}) + (\beta_{waiting\text{-}time}*V_{jn\ waiting\text{-}time}) + \varepsilon_{jn} \quad \textbf{(Equation 1)}$$

Where: Ujn is the utility derived by individual n from option j; Vjn is the observable component; β is the coefficient attached to Vjn a, also representing the part-worth utilities attached to the different attribute levels, and ε_{jn} is the unobservable component.

The odds ratios indicate the strength of preference for the different levels of the attributes of service delivery over others (302). Since the MNL is limited because of its preference homogeneity assumption, which renders it restrictive in describing human behaviour such as decision-making, we then went for the MXL, which relaxes the assumption (288). The MXL recognises the differences in preferences among individuals.

Furthermore, latent class Analysis (LCA), a statistical method, was used to detect unobserved heterogeneity within a sample by identifying subgroups sharing certain characteristics within a population (399). Class membership was assigned based on the highest probability of being a member. Stata version 16 (400) was used to analyse the data. We reported odds ratios and 95% confidence intervals.

Ethical Approval

Study participants provided written informed consent. This study received approval from the University of the Witwatersrand Research Ethics Committee (Medical) [Approval number M2111133]. In addition, ethical approval was also sought from study site authorities.

Results

Demographic characteristics

Table 2 summarises the respondents' characteristics. The participants were 18-24 with a median age of 22 years. About half (54.8%) reported that they were in stable relationships, about 70% confirmed that they were sharing with friends, family or partners. About 80% of the participants had at least one sexual partner in the past three months, 12% had at least two partners. In the past three months, almost half of the participants had accessed campus clinics (49%), public clinics (30.2%), or mobile clinics (16%). Also, unsafe sexual activities were reported by over two-thirds (69.7%) who reported not using a condom at last sex, and 16.7% having sex while under the influence of alcohol. Over 93.2% of the students had used a contraceptive method before, with over 60% using injectable contraceptives that is, a 2-month injection (Nuristerate) being

used by 37.5% and the 3-month injection (Depo-Provera) used by 27.6% of the participants. About a third (33.5%) of the participants had ever been pregnant. Most students (64.5%) indicated that CAB-LA would be their preferred method of taking PrEP, followed by oral PrEP (28.8%) while DVR was the least preferred (6.8%).

Table 2. **Background characteristics of study participants**

Background characteristics	**Frequency N=400(%)**
Age (years) median (IQR)	22 [21-23]
Study year	
First	184 (46)
Second	85 (21.3)
Third	108 (27)
Fourth	23 (5.8)
Relationship status	
Married	1 (0.3)
Stable relationship	219 (54.8)
Casual partner/s	99 (24.8)
Single	*81 (20.3])*
Live at home with parent(s)/ caregiver	77 (19.3)
Share accommodation with others[a]	268 (96.8)
Partner	9 (3.3)
Service utilisation	
# visited the facility in the last 3 months	362 (90.5)
Type of facility visited in the past 3 months	
Campus clinic	177 (49.0)
Mobile clinic:	58 (16.1)
Pharmacy	3 (0.8)
Public Clinic:	109 (30.2)
Hospital	4(1.1)
Private clinic/Drs private rooms	10 (2.8)
Sex without condoms	279 (69.8)
Sex und]er the influence of alcohol	
Yes	67 (16.8)
No	331 (82.8)
Unsure	2(0.5)
Treated of an STI in the last 3 months	35 (8.8)

Contraceptive use	373 (93.3)
Contraceptive method used	
3-month injection (Depo-Provera)	103 (27.6)
2-month injection (Nuristerate)	140 (37.5)
Oral Pill	49 (13.1)
Implant	72(19.3)
IUD	1(0.37)
Other contraceptives	8 (2.1)
Ever pregnant	134 (33.5)
Own children	122 (30.5)
Who makes main decisions on contraceptive use?	
Myself	311 (77.8)
Partner	3 (0.8)
Jointly	86 (21.5)
PrEP preference	
Oral PrEP	115 (28.8%)
PrEP ring	27 (6.8)
CAB-LA	258 (64.5)
Ever used PrEP	143 (35.8)
Current PrEP use	54 (13.5)

Notes:

a *[N=274, the total for the respondents who reported that they were staying with their mothers*

- *Intra uterine device: IUD*
- *Long-acting Cabotegravir: CAB-LA*

Mixed Logit Model

Table 3 depicts the determinants of students' preferences for service delivery using the Mixed logit model for DCE analysis. On the frequency of long-acting injectable PrEP dosing, there was lower preference for 6-monthly compared to bi-monthly administration [OR 0.98, CI: [0.93, 1.04]. Participants preferred to go back to the facility for support compared to getting assisted through a chatbot. Compared to getting a free service, participants preferred paying R50 and preferred being served by a provider specialising in PrEP services compared to a non-specialist [OR= 1.10, CI:1.04, 1.16]. Participants also preferred providers who were good listeners compared to those who

were not good listeners [OR= 1.30, CI: 1.23, 1.37] and waiting for an hour was least preferred compared to waiting for 30 minutes [OR = 0.79, CI: 0.75, 0.84].

Table 3: Mixed logit model for determinants of injectable long-acting service delivery preference

Attribute	Level	Parameter mean		P value	Parameter SD		P value	RI (%)
		OR	95%CI		OR	95%C1		
Frequency of injectable PrEP	2 monthly	***						
	6 monthly	0.98	[0.93, 1.04]	0.471	1.03	[0.75,1.43]	0.847	1.4
Support	Chatbot	***						4.8
	Back to facility	1.07	[1.02, 1.13]	0.01	1.00	[0.90, 1.10]	0.964	
Location	Campus clinic	1.12	[1.06, 1.19]	<0.001	1.17	[1.01, 1.35]	0.037	7.7
	Public Clinic	***						
Cost	Free	***						
	R50	1.14	[1.05, 1.25]	0.003	1.00	[0.83, 1.20]	0.975	46.3
	R100	0.58	[0.53, 0.63]	<0.001	1.00	[0.65, 1.58]	0.971	
	R150	0.66	[0.60, 0.73]	<0.001	1.01	[0.87, 1.18]	0.877	
Skills	Provider specialising in PrEP	1.10	[1.04, 1.16]	0.001	1.12	[0.91, 1.39]	0.281	6.3
	Provider not specialising in PrEP	***						
Sensitivity	Provider who is a good listener	1.30	[1.23, 1.37]	<0.001	1.22	[1.08, 1.38]	0.002	17.6
	Provider who is not a good listener	***						
Waiting time	30 minutes	***						
	60 minutes	0.79	[0.75, 0.84]	<0.001	1.13	[0.94, 1.35]	0.189	15.8
AIC								
8879.727 BIC								
9052.633								

Key: **** Reference level

*Odds ratio: OR

*Confidence interval: CI

*Standard Deviation: SD

* Relative Importance (RI). RI is the attribute's utility parameter range as a proportion of the total utility parameter range across all attributes.

* Akaike information criterion (AIC)

* Bayesian Information Criterion (BIC)

Latent Class Modelling

Three major classes emerged as there was no convergence beyond the third class. As depicted in Table 4, class one showed strong preferences for campus clinics, shorter waiting times, cost-effectiveness, and providers who are good listeners. The second class had the highest preferences for Services A and B, back-to-facility support, shorter waiting times, and PrEP-specialized providers. Cost and waiting time were important determinants for this group. All classes demonstrated a significant aversion to increasing costs. The utilities for cost were −0.18 for both Class 1 and Class 2 ($p<0.001$). The third class demonstrated the highest sensitivity to cost (β= -0.33, ($p=0.004$), strong preferences for back-to-facility support (β=0.65, $p=0.003$), and significant aversion to public clinics and providers who are not good listeners, (β= -0.44 (0.047).

Table 4: Latent Class Conditional Logit Model

Attributes	**Class1**		**Class 2**		**Class 3**	
	Utility	p-value	Utility	p-value	Utility	p-value
Frequency of PrEP						
2monthly*						
6monthly	-0.02 (0.1-0.06)	0.622	0.03 (0.17-0.23)	0.788	-0.28 (0.69-0.13)	0.186
Support						
Chatbot*						
Back to facility	0.05 (0.03-0.12)	0.200	0.18 (0.04-0.32)	0.013	0.65 (0.22-1.07)	0.003
Location						
Campus clinic*						
Public clinic	-0.19 (0.28-0.11)	<0.001	0.21 (0.1-0.53)	0.183	-0.45 (0.86-0.04)	0.030
Cost	-0.18 (0.23-0.14)	<0.001	-0.18 (0.27-0.09)	<0.001	-0.33 (0.56-0.11)	0.004
Skills						
Provider specialising in PrEP*						
Provider not specialising in PrEP	-0.04 (0.12-0.05)	0.373	-0.2 (0.38-0.03)	0.021	-0.22 (0.67-0.23)	0.333
Sensitivity						
Provider who is a good listener*						
Provider who is not a good listener	-0.41 (0.55-0.26)	<0.001	0.2 (0.04-0.45)	0.097	-0.44 (0.88-0.01)	0.047
Waiting time						
30minutes*						
1 hour	-0.17 (0.24-0.09)	<0.001	-0.31 (0.49-0.13)	0.001	0.13 (0.27-0.53)	0.529
Alternative						

Opt Out*						
Service A	5.93 (5.23-6.63)	<0.001	6.64 (2.67-10.61)	0.001	1.77 (0.92-2.61)	<0.001
Service B	5.6 (4.9-6.29)	<0.001	6.31 (2.37-10.26)	0.002	0.96 (0.15-1.78)	0.021
Background characteristics	**Class 1 Share**		**Class 2 Share**		**Class 3 Share***	
Age group						
20-24 years*						
18-19 years	15.03 (12.13-17.94)	<0.001	13.49 (N/A-)	<0.001		
Relationship status						
Single*						
Married	-212.9 (1126.25-700.44)	0.648	44.86 (41.77-131.48)	0.310		
Casual partner(s)	-0.42 (1.96-1.13)	0.598	-0.93 (2.63-0.77)	0.285		
Single (no partner)	-0.26 (2.05-1.52)	0.771	-0.02 (1.91-1.87)	0.984		
Study year						
First-year*						
Second-year	14.93 (13.66-16.21)	<0.001	13.73 (N/A-)	<0.001		
Third-year	0.11 (1.35-1.57)	0.884	-0.6 (2.17-0.97)	0.455		
Fourth-year	14.57 (318.94-348.08)	0.932	14.97 (318.53-348.48)	0.930		
Shares accommodation						
No*						
Yes	-1.49 (3.64-0.67)	0.177	-1.91 (4.17-0.36)	0.099		
Contraceptive use in last intercourse						
No*						
Yes	-14.03 (244.35-216.28)	0.905	-13.26 (243.57-217.05)	0.910		
Constant	17.99 (212.32-248.3)	0.878	17.02 (213.3-247.33)	0.885		

*Reference category/class
*probability value: p value. It describes the likelihood of obtaining the observed data under the null hypothesis of a statistical test.

As depicted in Table 5, classes differed significantly in age group and study year distribution. Membership in Class 1 and Class 2 was strongly associated with being aged 18–19 years ($p<0.001$) while class 3 exclusively comprises individuals aged 20–24. First-year students were significantly associated with membership in Class 1 and Class 2 ($p<0.001$). Class 3 had the highest proportion of third-year students.

Table 5: Association between latent class membership and selected participant characteristics

Background characteristics	Class 1		Class 2		Class 3		Test of association
	No.	%	No.	%	No.	%	
	n=296		n=87		n=14		
Age group							LRχ2(2) = 10.8056 p = 0.005
20-24 years	263	88.9	85	97.7	14	100	
18-19 years	33	11.1	2	2.3	0	0	
Relationship status							LRχ2(6) = 8.5471 p = 0.201
Married	0	0	1	1.1	0	0	
In stable relationship	160	54.1	50	57.5	7	50	
Casual partner/s	81	27.4	14	16.1	4	28.6	
Single - no partner/s	55	18.6	22	25.3	3	21.4	
Study year							LRχ2(6) = 31.6794 p < 0.001
First-year	127	42.9	48	55.2	8	57.1	
Second-year	76	25.7	8	9.2	0	0	
Third-year	82	27.7	19	21.8	6	42.9	
Fourth-year	11	3.7	12	13.8	0	0	
Shares accommodation							LRχ2(2) = 5.7674 p = 0.056
No	87	29.4	35	40.2	2	14.3	
Yes	209	70.6	52	59.8	12	85.7	
Contraceptive use in last intercourse							LRχ2(2) = 3.1394 p = 0.208

*probability value: p value. It describes the likelihood of obtaining the observed data under the null hypothesis of a statistical test.

Attribute order of importance

Table 6.3 also highlights the relative importance (RI) of the different attributes, with cost being the most important attribute, followed by sensitivity and waiting time while frequency of PrEP was the least in order of importance. RI of an attribute is the proportion of the total utility or preference variance explained by the attribute, calculated as the attribute's utility parameter range as a proportion of the total utility parameter range across all attributes.

Discussion

The study examined service delivery characteristics most important in encouraging students to take up long-acting injectable PrEP. The study informs the delivery of long-acting PrEP as it points out the young women's preferred type of health cadres, support required by young women, preferred location of receiving the services and the acceptable waiting times. Our

results show that participants preferred to return to the facility and speak to providers who are specialists in PrEP provision and good listeners for any PrEP-related support needed over using a Chatbot. Also, they opted to get their PrEP from campus clinics to public clinics. In addition, shorter waiting times were attractive to students. Three classes with varying background characteristics were identified.

Compared to getting a free service, students were willing to trade off a free service to get the provider characteristics that were important to them. Unlike in the hospitality industry, for example, where free services could be used to increase consumer demand, free services are often shunned when they present with hidden costs such as long waiting hours (Fan et al., 2022; Liu et al., 2020), especially in the health sector. Participants, therefore, considered paying a nominal fee of R50 [USD2.9] and be served by empathetic PrEP specialists. This implies that students are prepared to pay something, but high costs would deter service use. The study's three latent classes demonstrated a significant aversion increasing costs. Studies conducted in other African countries and also richer countries such as the United States also showed that cost was initially a barrier to PrEP use (234,401). There is still a need to source funds to sustain PrEP services as the potential clients are only prepared to pay a nominal amount for the quality of care they want.

Concerning the frequency of receiving PrEP services, there were no significant differences in preference between the 2-month and the 6-month injections. This could be attributed to the young women's perceived compatibility with CAB-LA, as most were on the 2 monthly administered contraceptives (253).

The students' preference for getting PrEP-related support from health service providers specialising in PrEP and who were good listeners suggests that these young women valued interactions with providers with these attributes. This could also imply that providers are valued as reliable sources of PrEP information. The participants' preference for sensitive providers also reflects the needs of the young women for a good relationship with providers. Studies have shown that young people generally trust providers who demonstrate respect, honesty, empathy, and confidentiality (402). Trust has previously been reported to be one of

the fundamental elements forming the provider-client relationship, with the nature impacting the client outcomes (354). The training of providers for long-acting PrEP should also cover the sensitivity of providers as young women present at facilities not only to get a PrEP product but also to value the nature of the relationship they have with the provider as they get the service. Providing PrEP services to young women goes beyond just administering the injections; students need to interact with providers after getting the service. Young women also need providers who listen to their concerns without judging them. Previous studies have shown how providers' judgemental attitudes deter young people from accessing health services (403). Also, some studies have reported that young women, especially the unmarried, face stigma and discrimination from healthcare providers while trying to get sexual and reproductive health services, negatively affecting their ability to access the services (403–405). Clients normally prioritise a friendly provider attitude (15). Future PrEP providers should be open to conversations with young people who approach them to ask questions about side effects and other concerns they may have while using the new long-acting PrEP technologies.

As young women are reported to face stigma and discrimination from healthcare providers, we expected that participants would rather choose to interact with technology than interact with them. However, their choice of sensitive providers implies they were aware of the stigma and discrimination challenges. Using technologies such as chatbots has been thought to reduce the stigma associated with getting PrEP at a facility (404). The young women's choice to get PrEP support from providers compared to the chatbots also suggests that they seem to realise the limitations of technologies such as chatbots in responding to their questions. Although nearly 100% of the participants owned a mobile phone and had access to the internet, access to these did not seem to influence their preferences for support services. This may imply that while young people may be technologically advanced, they still need human contact to address their concerns. This, however, complicates the DSD move to manage visits by offering virtual services (384). However, since long-acting PrEP is still new, initially young women may need provider contact but as they get used to the methods, chatbots may also be used. A systematic review reported that the use of mHealth technologies improved contraceptive use among young people (406), similarly, long-acting PrEP could benefit from

the use of technology. Our results however show that service providers are still an important part of the service mix but will need to be trained specifically to provide PrEP and to be good listeners. Future studies may need to explore this finding and understand why getting support from providers was preferred compared to getting it through technologies like the chatbot.

The young women's preference for campus clinics indicates their satisfaction with the attributes of the services they receive there. Campus clinics could be attractive because they are strategically located at the tertiary institutions hence offering students the benefits enjoyed through community delivery models. The benefits include overcoming logistical barriers such as walking long distances, transport or challenges in making appointments (381). One of the cited barriers to service utilisation among young people include transport costs (403). Furthermore, it is also convenient for students to access campus clinics. Campus clinics are known to provide youth-friendly services tailor-made to the needs of young people (407). Also, campus clinics mainly provide services to young people, hence creating safe spaces for young people. Since services are described by their attributes, it is important to unpack these attributes and use them to inform the providers' training. Providers at the campus clinics are trained to provide youth-friendly services; hence, it is not surprising that young women chose campus clinics because of the quality of services they receive. Other studies have documented the importance of youth-friendly services for young people (408). When we asked participants the types of facilities they had visited in the past three months, most had visited campus clinics, public clinics, mobile clinics, private doctors' rooms, hospitals and pharmacies. Mobile clinics serve the campuses usually once a week while campus clinics and public clinics open daily. While mobile clinics are convenient, the opening hours and days could be improved.

The preference for providers specialising in PrEP is interesting. This suggests that young women treated PrEP provision as a specialised area. By providing the same service over time, the providers would gain more experience, making them specialists and well-positioned to provide ongoing support. Specialist physicians who specialised in HIV, sexual health or infectious diseases have been used elsewhere to provide PrEP (190). The countries where the studies were conducted include Scotland, New Zealand and the United States. What is unique

in this study is that students preferred providers who are PrEP specialists. The preference for providers specialising in PrEP suggests that students trust providers who are specialists. This could, however, have financial implications for PrEP provision as there will be a need to add to the existing human resources. Also, this could complicate the DSD move towards the demedicalisation of PrEP and task sharing by using lay health workers (384). However, already existing healthcare providers can be trained in PrEP services for young people as it is important for service integration that these providers continue to perform other SRHR functions.

Students' preference for a short waiting time is not a surprise. Since these students were young women still busy with their studies, the opportunity costs of waiting for lengthy periods for PrEP were too high. Long waiting times are known to be one of the major barriers to service use among young people (403). Therefore, an attractive service for this population does not make them wait. It would be important to identify strategies to reduce waiting time at facilities to increase PrEP uptake and ensure sustained use of the services. Students have busy lifestyles with lectures to attend and assignments to work on; hence, waiting time is an important attribute of a service.

Limitations

This study was based on a hypothetical product as the injectable PrEP was not available freely in South Africa at the time of the study and is only being used in research studies. However, students are using injectable contraceptives. The service delivery outcomes of this DCE are still valid since the variables assessed also apply to the LA contraceptives that they already receive. These results could indicate what students would like to have basing on their experiences with LA contraceptives at the currently available clinics, with existing providers. Selection bias is possible since the participants were volunteers who met the eligibility criteria. This study was conducted at two tertiary institutions in one district; hence, the results may not be generalisable to the entire country. The participants were also all students; hence, their preferences may not reflect the preferences of other young women in the general population.

Conclusions

The value young women placed in interactions with sensitive health providers points to a need to invest in training providers involved in PrEP delivery to offer youth-friendly services. This will likely result in high uptake and sustained use of long-acting injectable PrEP. Campus clinics seem to be one of the places where youth-friendly services are provided; hence, more should be set up and considered for long-acting PrEP delivery. Future studies should look at strategies to shorten waiting times for young women.

Funding

This research was supported by the Consortium for Advanced Research Training in Africa (CARTA). CARTA is jointly led by the African Population and Health Research Centre and the University of the Witwatersrand and funded by the Carnegie Corporation of New York (Grant No. G-19-57145), Sida (Grant No:54100113), Uppsala Monitoring Centre, Norwegian Agency for Development Cooperation (Norad), and by the Welcome Trust [reference no. 107768/Z/15/Z] and the UK Foreign, Commonwealth & Development Office, with support from the Developing Excellence in Leadership, Training and Science in Africa (DELTAS Africa) programme. The statements made and views expressed are solely the responsibility of the Fellow.

Disclosure Statement

The authors report that there are no competing interests to declare.

Chapter 7: Integrative Discussion

7.1 Introduction

This integrative chapter presents the key findings from the PhD and highlights the cross-cutting themes from the three manuscripts bringing out the overarching story of this PhD.

Table 7.1: Study objectives and related key findings

Objective	Chapter	Findings
1. To explore the barriers and enablers of the use and delivery of current contraceptive offerings among women students to inform the delivery of long-acting PrEP formulations in Gauteng province	Four (4). Facilitators and Barriers to contraceptive uptake and use: perspectives of female students in South Africa and lessons for quality provision pre-exposure prophylaxis to prevent HIV. [Published in PLOS One] (252)	• At the individual level, side effects are a key barrier • At the family level, mothers play a key role, facilitating continued contraceptive use • Partners' concerns with side effects are sometimes a barrier to contraceptive use • At the health system, negative health provider attitudes and unfavourable working hours are barriers to service use • Access to contraception during holidays is a challenge
2. To explore young women's preferences and willingness to use the new PrEP technologies – ring and long-acting injectable at two tertiary institutions	Five (5). Perceptions of the attributes of new long-acting HIV Pre-Exposure Prophylaxis formulations compared with a daily, oral dose among South African young women: A qualitative study. [Published, in AIDS Care] (253).	• CAB-LA has a relative advantage over oral PrEP due to its bi-monthly administration, like injectable contraception • DVR was least preferred due to the perceived complexity of its insertion
3. To identify and determine service delivery characteristics that are most important in encouraging students to take up long-acting injectable PrEP	Six (6). Service delivery characteristics preferences and trade-offs for long-acting injectable pre-exposure prophylaxis among female students in tertiary Institutions in South Africa: A Discrete Choice Experiment [Published, Global Public Health](257).	• Young women preferred to return to the facility to get information on side effects and other questions than use a chatbot • Sensitive providers who are good listeners were preferred • There was a preference for providers who are PrEP specialists • Campus clinics were preferred over public clinics • Young prepared to pay a nominal fee of USD2.90 for the quality of services they needed.

As summarised in Table 7.1, the key findings in the thesis are organised by the three specific objectives presented in Chapter 1. Chapter 4 addresses the objective of exploring the barriers

and enablers of the use and delivery of current contraceptive offerings among women students to inform the delivery of long-acting PrEP formulations. The key findings included that side effects such as headaches and weight gain were a barrier to contraceptive use at the individual level. At the family level, mothers played an important role in supporting the continued use of contraceptives by reminding young women about their appointments and, in some instances, taking them to the appointment (252). There were also barriers to contraceptive use at the family/interpersonal level, such as the partner's perceptions of side effects, including fears of infertility. These perceptions affected their support for the young women's use of contraceptive services. Health system-related barriers included unfavourable opening hours, which made it difficult for young women to access services during the week when they attended classes, and negative health provider attitudes, which deterred health service utilisation (Shamu et al, accepted for publication). In addition, students struggled to access contraception during holidays when they were away from campus and their regular health facilities.

Chapter 5 explored the young women's perceptions of the characteristics of different PrEP methods using the Diffusion of Innovations (DOI) theory and how the characteristics influenced their willingness to use them. The DOI theory's five attributes include: relative advantage of the PrEP technology; compatibility; complexity; trialability; and observability. The three PrEP technologies compared were the oral PrEP pill, CAB-LA, and DVR. CAB-LA was the most preferred due to its relative advantage over oral PrEP as it is administered bimonthly like the injectable contraception Nuristerate, which is very familiar to young women (253). In Addition, CAB-LA was also perceived to be compatible with the young women's lifestyles compared to the daily oral PrEP pill. DVR was the least preferred due to its low efficacy and perceived complexity of administration (253).

Chapter 6 aimed to determine the service delivery characteristics that young women were willing to trade off for highly valued characteristics. The young women preferred to receive PrEP from campus clinics with sensitive providers, compared to community-based primary health clinics. Also, they chose to return to the health facility for PrEP product information and for help with managing side effects rather than choosing a chatbot (257). Young women

preferred healthcare providers who were trained in HIV services, including PrEP. There was a willingness to pay a small amount to receive PrEP from a trained and sensitive provider (Table 6.3).

7.2 Cross-cutting themes

In this section, I discuss the cross-cutting themes from the three papers. The study's aim was to explore female students' perceptions of new long-acting methods, experiences of HIV prevention methods and contraception, as well as oral PrEP, with the view to identifying attributes of services which can attract and sustain the use of new long-acting technologies

7.2.1 The context of tertiary institutions

The participants in this study were students in tertiary institutions. Students in tertiary institutions face a myriad of challenges. Since South Africa attained its independence in 1994, there has been a massive increase in the total number of students enrolling at universities, due to policies which have widened access to higher education. In particular, there is an increase in the number of students from previously disadvantaged backgrounds enrolling into institutions of higher learning (409). This has brought a wide range of challenges such as student drop out, accommodation shortages, infrastructure deficits, and funding gaps (410). University students in this study struggled to secure accommodation in campus residences as only 22% of contact students are catered for, the majority of whom are funded by the National Student Financial Aid Scheme (NSFAS) (411). This leaves almost 80% having to stay off campus. The challenges faced by students in tertiary institutions, such as lack of accommodation, may increase the vulnerability of young women (412). Young women may engage in transactional sex to cover the costs of accommodation and cost of living (413). Transactional sex has been linked to increased susceptibility to HIV infection (412,414).

Students at the two study sites received a range of SRH services like contraception, the screening and treatment of STIs, including HIV prevention services, as explained in Chapter 5 (253). These services were provided through mobile or fixed campus clinics.

In South Africa, there is a national agency which runs health services at tertiary institutions, currently covering 26 universities and 50 TVET institutions. It was initially set up as the Higher Education HIV and AIDS Programme (HEAIDS), working only with universities until 2014, when TVET colleges were added. It was then renamed the Higher Education and Training Health, Wellness, and Development Centre, known as Higher Health in short. Higher Health provides health and psychological health services to approximately 420 campuses in 52 districts covering both urban and rural sites (415). Higher Health focuses on areas such as mental health, sexual and gender-based violence; HIV/ TB/ STIs; SRH; LGBTQI+ community health; disability and alcohol and drug abuse prevention (415). These services responded to the various needs of young people at tertiary institutions.

Students' mental health in higher learning institutions have been prioritised due to the link to economic and human development(416). For some students, being at a tertiary institution could be the first time that they leave home, and they may be faced with increased opportunities for substance abuse (318), which could lead to unprotected sex, often linked to the heightened risk for HIV infections. While mental health issues are intertwined with SRH and known to affect young women, this study did not show mental health challenges among female students, although they are important.

The university site where this study was conducted had a fixed campus clinic and a mobile service clinic, which served the site at least once a week. The TVET college site, on the other hand, had no fixed clinic, but mobile clinic services were available. According to Higher Health, campus clinics are currently available at 26 universities and their campuses, where primary health services are provided by nurses, while 80 clinics were set up across TVETs, with the frequency of services offered ranging from daily to monthly (415). This could have placed the university students at an advantage compared to the TVET college students, who had to rely on public clinics during the periods when the mobile services were not available. This could affect PrEP delivery among students, especially where campus clinics have not been set up. Establishing campus clinics at all TVET colleges that offer PrEP services can ensure that students have uninterrupted access to PrEP. However, campus clinics also room for

improvement, for example, they only opened for a restricted number of hours per day, and this often presents a challenge to students who have to attend lectures (252).

7.2.2 Sexual and Reproductive Health needs of Young Women in tertiary education

College and university campuses provide an opportunity to engage young women in HIV prevention at a time when they are sexually active and trying to prevent pregnancy. Young people spend a considerable number of years in tertiary institutions where youth-friendly services are needed (417) and, in some instances, available as described in section 7.2.1.

While all young women have needs, young women in tertiary institutions have unique needs emanating from temporary migration and distances from campuses, to continuity of care during holidays and managing the impact of side effects on their lives. It is evident that these young women are experiencing challenges, especially at the SEM community level of the health system. Young women were still studying and had limited stability in their lives as they were moving from campus accommodation back to their provinces of residence or moving to their family homes within the province during semester breaks. Since these young women were not permanently settled on campuses, this made it difficult for them to consistently use SRH services, especially when they went home and could not access the campus clinics, which they described as youth-friendly. Young women reported using contraceptive services, and some struggled to continue using services due to perceived side effects and also difficulties in accessing public clinics, especially during semester breaks (252).

In the three manuscripts, young women expressed the need for support from service providers to manage side effects related to both contraceptive use and long-acting PrEP. Young women also showed how services provided to them were valued by expressing the need for sensitive providers who are good listeners, as in Chapter 6 (257). This aligns with Chapter 4 (252) where participants mentioned negative health provider attitudes as one of the barriers to public health service utilisation. Students expressed dissatisfaction with how some providers at public health clinics shouted at them in front of their peers, which negatively impacted their self-esteem. Good self-esteem, especially in early adolescence,

increases the probability of perceived good mental well-being (418). For the successful delivery of long-acting PrEP, it will be important to provide services that are sensitive to their needs and emotions. This points to a need to address the challenges in the health system at the community level of the SEM.

7.2.2.1 Role of providers in the provision of sexual and reproductive health services

This study demonstrated the importance of healthcare providers in the provision of sexual and reproductive health services. This again stresses the importance of the health system at the community level in the SEM. The person who provides the service is key to its sustained use. Through the differentiated service delivery (DSD) for PrEP, the WHO highlights the importance of **who** provides the service and **what, where,** and w**hen** it is provided (94). DSD is about providing services tailor-made for a specific population to meet their unique needs (382). A study conducted in South Ethiopia showed that adolescents preferred male, younger health care providers who were also not from their neighbourhood (419). In South Africa, DSD is already being implemented in HIV treatment to improve treatment outcomes and quality of life through increasing the responsiveness of the programme to meet individual needs (420), hence important lessons from HIV treatment could be applied to prevention. The DSD model for HIV treatment has been focusing on components of service delivery such as convenient locations for service delivery, reducing frequency of visits, and identifying the suitable provider cadre (420). In the same manner, this study has also sought to determine preferred service delivery components related to long-acting PrEP provision as explained in Chapter 6 (257).

Specialist, sensitive providers will be important in long-acting PrEP provision. While some young women pointed out that they discontinued contraceptive use due to side effects, this points to the important role providers play in helping young women manage side effects. In Chapter 4, I also report on how providers advised on the best contraceptive method to use and the associated side effects for those who are actively using it (252). Providers also played a key role in recommending certain methods. In the provision of long-acting PrEP, providers are expected to offer informed choice counselling to young women.

In Chapter 5, the manuscript looks at young women's perceptions of new long-acting contraceptive methods, and found that students did not have confidence in their skills of inserting DVR properly (253). Hence, they suggested that they needed providers to insert it first. To cater for the needs of such PrEP clients, there is a need to consider offering sensitive providers who are willing to support young PrEP users in their initial journey of PrEP use. In addition, they also referred to other prevention technologies inserted by providers and could then blame them if anything went wrong with the method. The DSD for PrEP should consider involving service providers as the young women lacked trust in self-administered products.

In Chapter 6, which covers the DCE, young women were asked to choose whether they would like to receive support in managing side effects either through a chatbot or by going back to the service provider at the facility, and there was a strong preference for service providers (257). The choice of human providers over chatbots could have been influenced by clinical and ethical concerns arising from the use of these technologies (421). Ethical issues are raised as chatbots are considered as not being able to provide empathetic care or to respect clients as people (422). In this study, the students' exposure to chatbots may be limited, especially for help-seeking and this limited experience could have influenced their preference for health care providers. A study conducted at the University of Westminster reported that patients were more likely to use chatbots than health care providers when dealing with highly stigmatising health conditions like STIs (423). The role of healthcare providers cannot be underestimated and remains important in-service provision. However, to solve complex challenges in PrEP implementation, there is a need for a variety of approaches to increase uptake, such as offering alternative delivery platforms like pharmacies and telemedicine (424). Similar sentiments have been echoed in a different study where the need to engage private health facilities, strengthen community-based provision of SRH services, and also engage faith-based organisations was raised (419).

Implementing youth-friendly services consistently and effectively will be important in delivering long-acting PrEP services. South Africa established the National Adolescent Youth Health Policy in 2017, which was set to enable the provision of a package of services to adolescents and youth (425). Its implementation, however, needs to be monitored and

evaluated, especially in public health clinics. While the policy provides for the provision of youth-friendly services and also the operationalisation of clinic hours to accommodate learners' timetables (425), the study participants' perceptions of the health system indicate that this is not being realised and some even mentioned that they felt catered for while in high school but not in tertiary institutions, especially concerning the health facilities opening hours. Additionally, the negative provider attitudes experienced by students at public health facilities could be an indication that not enough providers have been trained to offer YFS or some providers are not just practising what they have been trained to do. The students preferred to get services from campus clinics. Campus clinics are known to provide services to young people which are youth-friendly. Since young women also chose to go back to the health facility for support on side effects, providers trained to offer youth-friendly services would make the services attractive. In a study conducted among adolescents in South Ethiopia, pharmacies were a preferred venue for accessing condoms and emergency contraception (419).

Some key features of adolescent-friendly services have been identified in low- and middle-income countries. These include culturally appropriate, responsive interventions and a non-judgemental environment (426)providing a service to young people in a confidential manner, and the use of peer educators,. A study conducted in South Africa exploring barriers to the provision of youth-friendly services for adolescents living with HIV in clinics in Gauteng Province, South Africa, identified factors which influenced the provision of youth-friendly services. Health system-related factors identified included human resources challenges, the attitudes of health workers towards the provision of mixed services, and the shortage of space. Shortages of space resulted in a lack of privacy and confidentiality, resulting in some adolescents defaulting on their treatment since they were being served in the same space with adults (427). There is need to ensure that such challenges do not affect PrEP delivery.

7.2.2.2 Campus clinics are preferred points of service delivery

Campus clinics will be one of the important service delivery points for long-acting PrEP. Taking advantage of the already established systems and mobilising them to provide long-acting PrEP will be beneficial. In South Africa, most institutions have campus clinics already providing SRH

services and their institutional web pages are used to create awareness of the available services and the location (428). Campus clinics were one of the preferred places for getting contraception in this study and this could be because of the sensitive providers (Shamu et al, accepted for publication). This emerged in Chapter 6, where campus clinics were preferred as points of long-acting PrEP delivery compared to public clinics. Campus clinics' convenient location and youth friendliness in service delivery could explain this preference, as students praised the service providers for being sensitive and friendly compared to those who served them at public clinics (Chapter 4, accepted for publication). While young women at universities face almost similar challenges in accessing health services as reported by other young people in previous studies, such as long waiting times and negative health provider attitudes, students face an additional barrier of not being able to leave classes to attend their health care needs hence campus clinics are strategically located. A scoping review which appraised the effectiveness and feasibility of PrEP service delivery models designed to promote linkage to PrEP care among AGYW in sub-Saharan Africa reported that community drop in centres were identified as suitable PrEP delivery points for AGYW compared to public clinics (429). Since students will eventually complete their studies and not get access to campus clinics it is important to identify other potential delivery points.

7.2.2.3 Understanding decision-making among young people

In addition to understanding the needs of young women, it is also essential to understand how they make decisions. As resources are limited, this forces individuals to make choices that call for decision-making. In the DCE, we saw quantified decision-making, whereby students traded off the different attributes, and their preference weights could also be quantified. DCEs are premised on the random utility theory (RUT), which assumes that decisions are made rationally as explained by the Random Choice Theory (RCT) (430). The RUT, however, also has a component of human behaviour that researchers cannot explain by covering the random/unobservable or unexplainable component.

Critics of the rationality theory, like Herbert Simon, proposed the Bounded Rationality theory (431,432), which reveals the impracticality of gathering all the information. Simon acknowledged the complexity of decision-making and the cognitive limitations confronting

individuals (432,433). He replaced the idea of utility maximisation with a more realistic economic behaviour termed “satisficing.” (433). Satisficing, for example, assumes that one sometimes does not make the optimal decision but one that satisfies other criteria, such as being ethical. It postulates that decisions are not always made rationally, but other players/forces are at play.

SEM acknowledges other players' roles in decision-making. Decision-making among young people is, therefore, complicated. It emphasises the role of products, services, partners, family, community, health care systems, and policy in influencing young women's influence in decision-making processes (293). At the health system level, health providers are still important in young people’s decision-making processes. This was shown in the three manuscripts. In Chapter 4, negative provider attitudes discouraged continued service use; in Chapter 5, students said they trusted provider-administered prevention products, and in Chapter 6, students preferred to go back to them to get further support, such as management of side effects in PrEP use. Sometimes, emotions influence decisions (434,435), hence the need for sensitive healthcare providers at the health system level, as explained in Chapter 6 (257). Decision-making for PrEP is, therefore, a combination of quantifiable individual decisions as well as partner/family, health system, and community contributions to the decision-making, which leads to continued PrEP use or discontinuation.

This PhD used the social ecological model (SEM), which places the young woman (individual level) at the centre but acknowledges the role played by partners/friends and family (household level) and providers (health systems level) in decision-making. The role contributed by the partners' family or friends could be part of the cultural capital referred to by Bourdieu, a French sociologist. At the household level, the formative qualitative work revealed the role of mothers in decision-making. Mothers played an important role in young women’s contraceptive uptake. They were sources of information and advised young women on the types of contraception to choose. This role of mothers as sources of advice and SRH information has been reported in other settings (436–438). By providing information, mothers guided the young women in decision-making for contraception in addition to the practical support mentioned earlier, such as providing transport or transport money for their

daughters when they were going for contraceptive appointments. There is, however, a need to consider other potential sources of PrEP related information. In a study conducted in Ethiopia among adolescents, peers experiencing similar problems and sexual partners were preferred sources of SRH information (419). Bourdieu explains cultural capital as how the surroundings unconsciously influence an individual's initial learning (439). Social norms influence decision-making (283). Students' tastes could be influenced by their surroundings--it is not exclusively an individual decision. SEM helps us understand why young women choose certain service characteristics, which will help inform long-acting PrEP delivery. What tends to be quantified through DCEs as trade-offs could be largely influenced by the interactions at home. As there are many spheres of influence in SRH decision-making, at the individual level, agency of the young woman plays a key role in enabling young women to continue using SRH methods, even in the face of opposition or support from parents, partners, communities, and at the health system levels (440).

To answer the question of what the enablers and barriers to contraceptive or HIV prevention methods use are, we sought to understand the facilitators and barriers to young people's use of SRH services and how they make their SRH decisions through qualitative formative research. In Chapter 5 I highlighted how the attributes of the innovation, such as its relative advantage, compatibility with students' lifestyles, complexity, trialability, and observability of method use, could influence the decision to use long-acting PrEP methods (253). The formative research then led to the DCE, which quantified the observable and unobservable components of the decision-making process through RUT.

7.2.3 Young women in tertiary institutions are a mobile population

Most young women live in temporary accommodation as students. There is a need to find ways to encourage them to continue using PrEP even during semester breaks. These young women have new freedoms in this phase of their lives as they rent their temporary accommodation alone, making it easier for them to use PrEP. These young women are, however, a mobile population, as some go back home to their parents/guardians during semester breaks, where using PrEP may become difficult. A previous South African census report identified education and employment as some of the determinants of internal

migration (441). Some of the study participants had migrated for educational reasons; hence, they would travel back to their home provinces. The Gauteng province, where this study was conducted, receives the highest number of internal and international migrants compared to other provinces (442). Differences in overall service utilisation and type of service used have been observed among migrants and non-migrants in a study conducted in South Africa (443). There are, however, some who reported that they were not sexually active during semester breaks as their partners were at college. This group of young women may not need PrEP support during semester breaks if they are taking oral PrEP or DVR. There is, however, a need to support young women who would want to continue using PrEP both during semester breaks and when they are done with their studies so that they continue to prevent HIV.

7.2.4 Trust in products, providers and the health care system

Trust in the product, provider, and the health care system itself is key in the provision of services. It is a fundamental aspect of the relationship between an adolescent and their providers (402). Familiarity with a products' mode of delivery is important for young women as this builds trust in the product, but the challenges of long waiting hours, limited operating days, and lack of privacy affect this trust. Female students showed that they were willing to use long-acting injectables as they were already using injectable contraceptives. This increases the chances of CAB-LA's success. However, the challenges expressed in the delivery of contraceptives need to be addressed, as this may likely affect the delivery and continued use of long-acting PrEP. The young women also expressed their trust in the campus clinics. Mobile clinics were also trusted but the challenge was long waiting hours, limited operating days, and lack of privacy especially when it comes to HIV testing.

7.2.5 Long-acting injectable PrEP is preferred

Young women like the discretion that of long-acting PrEP offers. In this study, they chose CAB-LA over DVR and oral PrEP. CAB-LA was seen to be more compatible with the students' lifestyles. This appeared in Chapters 4 and 5. In Chapter 4, it was reported that most students preferred using the bi-monthly administered contraceptive (Nuristerate), which offers an opportunity to integrate the service with CAB-LA. In Chapter 5, which explored university students' perceptions of the attributes of PrEP technologies in South Africa, CAB-LA was also

chosen over other methods due to its perceived relative advantage and compatibility with the students' lifestyles, especially when they would go out to have parties with their friends (253). CAB-LA made them ready even for unplanned outings.

Although CAB-LA is generally preferred, as explained in Chapter 6, after discontinuing CAB-LA, one could take oral PrEP or other HIV prevention methods for about 12 months to minimise the risk of developing drug resistance should they seroconvert while they still have traces of cabotegravir in their system (160). While CAB-LA offers many desirable benefits to the young population of university students, managing the cabotegravir tail through taking oral PrEP or another HIV prevention method is one of the challenges. Young women may struggle to take oral pills as prescribed since they indicated how taking a daily pill was incompatible with their lifestyles.

Although CAB-LA was the preferred option among young women, it is still a costly option. The estimated cost of CAB-LA per injection, according to the economic modelling studies conducted in South Africa, needs to be between USD9 and USD14 (75) for it to be cost-effective, yet the current cost of CAB-LA per injection is estimated at USD31 [GBP24] while in the United States of America (USA) it is about USD3700, making the South African price 127 times cheaper than the USA price, and four times the cost of a two month's supply of daily oral PrEP (444–446). CAB-LA should be reasonably priced for its implementation to be financially feasible, especially in low and middle-income countries where HIV incidence is high it has great potential to curb new infections (445). Cost-effectiveness studies have been conducted in both high-income and low-income countries, and a study conducted in the USA showed that initiating CAB-LA was cost-effective compared to taking generic oral PrEP (447).

7.2.5.1 Low preference for PrEP delivered through the vaginal ring (DVR)

The young women showed a low preference for DVR even after feeling and touching it. The perceived complexity of DVR explains the low preference. While VMMC only had a 60% chance of preventing men from getting HIV, DVR reduced HIV prevention risk in the ASPIRE and Ring clinical trials by about 30%, by about 50% during periods of use, and by over 75% with consistent use as observed through secondary analysis (142). Although VMMC's chance

of preventing HIV is considerably low, its uptake could have been supported by the desire to conform to social norms such as among the amaXhosa people in South Africa, and the perceived benefits of health and sexual pleasure to the one who takes it up (115). In creating demand for DVR, it would be important to emphasise the benefits of using DVR to young women. With consistent use, the HIV risk reduction could be higher, and it would also be beneficial to stress the benefits which DVR brings, such as fewer side effects, since the efficacy is lower than that of the other PrEP methods. While VMMC uptake is supported through its social desirability, such as among the Akan ethnic group in Ghana (2), DVR could however go against the beliefs of some cultures where the female genitals must not be touched, a challenge witnessed with the female condom (FC) (101); hence the demand creation for DVR should address that. Just like the FC, which some young women perceived as being too big and awkward to wear and remove, as one study among female university students in Tanzania found out, DVR was also viewed in the same light by the study participants who were also female students (448).

Identifying other purposes for the DVR could make it more acceptable. Multipurpose prevention products seem to be the panacea to the challenges presented by DVR. They could provide a response to the multiple SRH challenges faced by women across the globe (449). Similar to the idea of the dual prevention pill (DPP), where a daily pill is taken to prevent both pregnancy and HIV (450), the idea of combining contraceptives with HIV prevention drugs is being explored in clinical trials. Multipurpose intra-vaginal rings—such as the one in the first phase of clinical trials combining the antiviral Tenofovir and levonorgestrel, a contraceptive administered every three months, and in another trial, dapivirine and a non-hormonal contraceptive releasing copper and/or zinc ions monthly—were found to be acceptable to participants due to their multifunctional nature and ease of insertion and removal. The results support the continued development of these multipurpose rings (451,452) as promising technologies. The concerns expressed by the young women in this PhD study regarding the size of the ring could likely be addressed through actual product use, as observed with the multipurpose vaginal ring, where participants initially had similar concerns which faded over time with product use (451).

7.2.6 Strengths and limitations

The study population was university students with experience using both campus and public health clinics, providing a balanced view of the different health delivery sites from a student perspective. This study adopted a mixed methods approach using FGDs, IDIs, the nominal group technique, and a DCE, which enhanced the understanding of a complex health problem (453). The triangulation of methods increased the credibility and trustworthiness of the qualitative findings as we were able to compare and contrast the insights obtained from the different methods. Using a DCE allowed for eliciting user preferences for the service attributes they preferred for the delivery of long-acting PrEP methods, as these were not yet available outside of clinical trials at the time of data collection. The use of different methods of data collection such as FGDs, IDIs, the nominal group technique, and the DCE ensured that the different methods cross-checked each other, as Denzel argues (242). The mixed methods approach was the best for eliciting young women's service delivery preferences, which allowed for getting into the depth and breadth of the topic. Most of the data were collected by two trained research assistants. Both spoke a variety of local languages allowing participants to express themselves in the language of their choice.

One limitation of the study was that at the time of data collection the long-acting PrEP methods, such as CAB-LA and DVR, were not yet available; hence, participants were only discussing hypothetical products. Additionally, the study was conducted only in one province, including other provinces could have added different perspectives. This study focused on students' perspectives only and did not capture providers' perspectives. Future studies should capture the views of service providers as well. The DCE relied on a volunteer sample, which could have resulted in sampling bias. It is possible that in the IDIs and FGDs participants told us what they thought we wanted to hear. This social desirability bias may have affected the trustworthiness of the findings. That said, the application of multiple methods helped to mitigate this. The participation of participants in the workshops that were held to develop the attributes for the DCE was affected at one institution by the time that participants had available. Some had classes which meant that they were not able to stay to the very end. Thus, the synthesis of the attributes across the groups was validated by only some of the participants. The workshops were held in English as the PhD researcher co-facilitated. It is

possible that participants did not speak as freely as they would have when speaking their mother tongue.

Chapter 8: RECOMMENDATIONS

This chapter presents the recommendations and conclusions of this study based on its integrated findings. It also provides directions for future research, policy implications, and contributions of this research to the HIV prevention field.

8.1 PrEP services need to be strengthened to meet the needs of AGYW

8.1.1 Electronic capturing of young people's SRH records

First, the electronic capturing of young women's SRH records needs to be strengthened. As South Africa prepares for the implementation of the National Health Insurance (NIH), the DoH has worked with stakeholders to develop a patient tracking system that is expected to work in conjunction with the electronic health record (EHR)system to improve both quality and continuity of care (340). Since young women are mobile, ensuring that the records have been captured electronically will be important.

In South Africa, some attempts have been made to implement electronic health records (EHR) systems; however, this was being done through various vendors with different underlying database architectures, resulting in the systems failing to communicate with each other (340). In other African countries such as Ghana and Malawi, attempts to implement EHR have been hampered by an erratic electricity supply, lack of government support, and resistance from healthcare providers, among other factors (454,455). The South African DoH should ensure that all records, especially for young people, have been captured in an electronic database to ensure continuity of care during semester breaks and even after students have completed their studies.

Our study found that students struggle to access health facilities which use a different health record system, as reported in Chapter 4 (Shamu et al., accepted). In the same chapter, I also reported on how some students tampered with their handwritten health records by trying to create the records they thought would be acceptable at the facility they were visiting. This compromised the trustworthiness of the notes that providers were supposed to rely on.

Having an electronic database would help not only to ensure continuity of care but also to protect the integrity of health information. There is a need for a transition plan as students move from tertiary institutions, both temporarily during vacations and as they permanently move after completing their studies.

Additionally, meeting the needs of young women is crucial in service provision. There have been numerous efforts to improve the quality of services provided to AGYW. Strengthening these efforts is critical in the context of delivering PrEP. The DoH launched a National Adolescent and Youth Health Policy in 2017, which commits to "Provide a package of services for adolescents and youth as well as strategies to render these services across all levels of the health sector, starting with PHC up to hospital care. Provide healthcare workers with pre- and in-service training on Adolescent and youth-friendly services by incorporating an AYFS curriculum. The curriculum must include psychosocial and communications skills that promote the specific developmental needs of adolescents and youth." (p.6) (425). The commitment to providing in-service training on adolescent and youth-friendly services will need to be intensified. This will ensure enough providers are trained to provide youth-friendly services to young people. Since young people indicated that they would be interested in getting PrEP-related support from sensitive, non-judgmental providers, equipping the providers to offer such services would make the services attractive to young women. This will potentially lead to continued use of services. In addition, all tertiary institutions should have fixed campus clinics. Campus clinics play an important role in the lives of female students in their attempt to prevent both pregnancy and HIV. In Chapter 6, students showed that they preferred campus clinics to public clinics as they are known to provide youth-friendly services.

Provider's training should also emphasise the importance of choice counselling and management of side effects. As discussed in Chapter 4, young women as contraceptive users, complained that providers did not spend enough time discussing side effects. To avoid early discontinuation of long-acting PrEP due to lack of support in managing side effects, similar to how some young women reported discontinuing contraception due to unbearable side effects, offering support through counselling will be crucial in PrEP provision.

To support continued PrEP use, there is a need to train some students as lay PrEP providers. Universities could take advantage of peer educators and train them to help students deal with side effects outside working hours when the specialists are no longer available to serve them. Task shifting could reduce the burden on the health system, as recommended by WHO (456). Since students struggled to access health services on semester breaks, peer educators and other lay providers could be more approachable and facilitate service use.

8.1.2 Facility opening times to be revised to accommodate busy young women's schedules

Matching facility opening times with young people's availability will help make services attractive. Providing youth-friendly services to young people should entail offering the services at a time that can accommodate young women, especially those who are working or attending tertiary institutions. As unfavourable opening hours emerged as a barrier to contraceptive service use, it will be essential to offer prevention services during weekends and after hours as students may fail to access the service during current hours. Young people with busy lifestyles need to be accommodated so they can continue to use prevention services. There is a need for the DoH to find innovative ways of providing the service.

8.2 Updating Comprehensive Sexuality Education

There is a need to constantly update the comprehensive sexuality education (CSE) currently being delivered in high schools. A report presented by the Department of Basic Education to the members of parliament as part of a portfolio committee in 2019 revealed that CSE has been provided in schools as part of the Life Orientation subject and no new curriculum had been added since 2000 (457). Although the life skills programme is being implemented in schools, the United Nations Population Fund (UNFPA)'s assessment of CSE in the KwaZulu-Natal province revealed that inadequate training and experience among educators hindered its successful implementation (458). The DBE has delivered CSE through different co-curricular programmes since 2013, such as Determined Resilient, Empowered, AIDS-free, Mentored and Safe (DREAMS), She Conquers, and Keeping Girls in Schools (457). UNFPA's

assessment also highlighted the lack of a detailed, scripted sexuality education curriculum that is widely adopted at the national level. It, however, acknowledged the presence of the Curriculum and Assessment Policy Statements (CAPS) categorised into grades R-3, 4-6, 7-9 and 10-12, although these lack enough detail and guidance on activities to be implemented. Also, gaps were identified at each of the four CAPS levels; for example, in the grade 4-6 phase, sexuality topics, including reproduction and anatomy, were not being taught (458).

Since PrEP comes in different forms with varying forms of administration, there is a need to make young people understand their bodies from an early age concerning how the different PrEP formulations work. Although comprehensive sexuality education is being offered to high school learners in South Africa, there is a need to constantly align the teaching with the developments in the HIV prevention space, since there are some HIV prevention technologies which are still in the pipeline. To achieve a real expansion of choices, it is important to debunk the myths surrounding DVR. This could be achieved through body-mapping exercises, which should be introduced in earlier grades of the CAPS curriculum. Young people need to be guided on their reproductive anatomy so that later on, they may understand how PrEP formulations like the DVR work and where it fits, as it seems to be misunderstood as presented in chapter four and five. It is also important to help them understand how the cervix works. Although some of these concepts are currently being covered under the Life Orientation subject, there is need to link it with how the new PrEP formulations work. A better understanding of the cervix will help young women understand how it stops any technologies, such as DVR, from going beyond it. The cervix makes it impossible for the DVR to disappear into the young woman's body. Proper knowledge of the reproductive health system should then help debunk the myths about the DVR.

8.3 Community mobilisation

Finally, as oral PrEP is still stigmatised, the DoH will need to mobilise communities and raise PrEP awareness. The community mobilisation process will be about bringing young people and the older community members together to discuss PrEP issues. As young people argued

that the oral PrEP pill looked like ARVs as presented in Chapter 5 (257), this makes it difficult for them to take it. Bringing the young people and older community members together in the community mobilisation process would help ensure that oral PrEP becomes more acceptable to both young and old people.

8.4 Future Studies

As this study's findings are mainly based on students' experiences of using long-acting contraceptive methods, cohort studies of young women who use different PrEP methods to explore the challenges and enablers of effective PrEP use would be helpful in future.

8.4.1 Relevance of findings for setting policies

While participants chose CAB-LA over DVR and oral PrEP, CAB-LA is still relatively expensive, and policymakers must find the best ways to make it financially feasible to deliver it. Intensifying demand-creation activities to ensure that potential users are aware of the existence of CAB-LA could create adequate demand for it. The manufacturer should ensure that the supply outstrips the demand, which could eventually force down the price, especially when new producers come on board. Although CAB-LA is relatively expensive compared to other PrEP formulations, it is highly effective in curbing new HIV infections and also supports adherence, especially among young people; therefore, there is a need to test different delivery options. The study participants were prepared to pay a nominal price for CAB-LA delivery, although they were students with no income. Cost-sharing options could also be explored through economic modelling.

In addition, provider buy-in will be an important component of HIV PrEP service delivery (459). It will be important to address barriers to PrEP uptake among providers through imparting knowledge and investing in training, which will help providers to deal with their personal biases. Providers' judgements on PrEP eligibility can be potentially clouded by both conscious and unconscious stereotyping and prejudice if left unchecked (460).

8.5 Conclusion

Young women showed a general preference for CAB-LA over oral PrEP, while DVR was the least preferred. The bi-monthly administration of CAB-LA offers an opportunity for integration with injectable contraceptives with a similar pattern of return visits. DVR was the least preferred because of the perceived complexity of its administration, as some feared that it might disappear in their bodies, and also the lower efficacy. Daily oral PrEP was disliked by many because of the stigma and burden of taking a daily pill. There is, therefore, a need to adequately train providers in offering informed choice counselling, as one method will not suit all. Given the high cost of CAB-LA compared to oral PrEP, decisions will need to be made about the feasibility of offering it as one of the PrEP methods available to young women, especially in the face of donor funding cuts. Modelling studies projecting the global impact of donor funding cuts on HIV prevention have underscored an urgent need for national governments to invest in sustained HIV alleviation programs (461). Lenacapavir is projected to be cheaper than CAB-LA, with an estimated annual cost of USD40 per person, which is almost similar to the cost of taking daily oral PrEP, compared to USD160 for CAB-LA (462).

Sensitive providers are essential in providing any form of PrEP, including the preferred long-acting PrEP. Young women value interactions with sensitive providers who they view as being good listeners, open, and non-judgemental. Healthcare providers are an important attribute of service delivery despite technological advancements. Young people still choose to go back to the health facility to ask their questions to providers instead of asking through a chatbot. Therefore, technological limitations could have made young people choose providers as reliable and trusted sources of PrEP-related information. Technology was preferred only for creating awareness about the different PrEP technologies. However, as explained in Chapter 6, after the young women have gained experience with using the long-acting PrEP methods, technologies like chatbots may later become convenient options for getting support (257).

Campus clinics are attractive service delivery points for PrEP, hence, all campuses should have clinics. Campus clinics are accessible and, with no service fees, cater to young women's needs.

Also, providers serving at campus clinics are trained to provide youth-friendly services. In addition to providing a conducive environment for the young people, the non-judgmental attitudes of the providers would complement the service, making it attractive to the young people, and this was what constituted youth-friendly services. A systematic review which examined youth-friendly services identified three main domains - accessibility, staff competency and characteristics, and privacy and confidentiality (98). These important service delivery attributes will be attractive to students. However, campus clinics will need to review their opening hours so they can fully provide services, especially to the student population.

Young people are willing to pay only a nominal fee for the quality of the services they receive. This means there is a need to subsidise PrEP services, which will attract young people. Subsidising the services will help ensure enough sensitive and non-judgemental specialists are available to provide long-acting PrEP.

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Chapter 10: APPENDICES

10.1 Appendix A. Ethics Approval Certificate

UNIVERSITY OF THE WITWATERSRAND JOHANNESBURG

HUMAN RESEARCH ETHICS COMMITTEE (MEDICAL)

Office of the Deputy Vice-Chancellor (Research and Innovation)

TO: Ms P Shamu
School of Clinical Medicine
Department of Obstetrics and Gynaecology
Wits Reproductive Health and HIV Research Institute
Medical School
University

E-mail: pshamu@wrhi.ac.za

CC: Supervisor: Professor S Mullick
<smullick@wrhi.ac.za>
and <HREC-Medical Research Office@wits.ac.za>

FROM: Mr Iain Burns
Human Research Ethics Committee (Medical)
Tel: 011 717 1252

E-mail: Iain.Burns@wits.ac.za

DATE: 2022/07/05

REF: R14/49

PROTOCOL NO: **M2111133** (This is your ethics application reference number. Please quote it in all enquiries, oral or written, relating to this study.)

PROJECT TITLE: *Preferences for service delivery for long-acting HIV pre-exposure prophylaxis formulations amongst students in tertiary institutions in South Africa: a discrete choice experiment*

Please find attached the Clearance Certificate for the above project. I hope it goes well and that an article in a recognized publication comes out of it. This will reflect well on your professional standing and contribute to Government funding of the University.

MSWorks2000/Iain0007/Clearscan.wps

10.2 Appendix B. IDI Participant Information Sheet

PARTICIPANT INFORMATION SHEET - IN-DEPTH INTERVIEW

Good day!

STUDY TITLE
Preferences for service delivery for long-acting HIV Pre-exposure prophylaxis formulations among students in tertiary institutions in South Africa: A Discrete Choice Experiment

INVITATION PARAGRAPH
We would like to invite you to take part in an in-depth interview (IDI) regarding preferences for delivery of new long-acting HIV prevention methods (pre-exposure prophylaxis [PrEP]) some of which are still being developed. These new methods involve use of some of the medicines used for HIV treatment, known as antiretroviral drugs (ARVs) to prevent HIV among people who do not have the HIV virus. The long-acting methods include the dapivirine vaginal ring, also known as the PrEP ring for preventing HIV among women. The other methods include a 6monthly injection, with an ARV called lenacapavir and also a monthly pill called Islatravir. This information will provide information on how services should be best provided in a way that is more acceptable to young women in South Africa's tertiary institutions. Since these methods are not yet available, much of our discussion will be around your experiences with using contraceptive methods and existing HIV prevention methods which you are more familiar with.

Before you decide whether or not to take part, it is important for you to understand why the research is being done and what it will involve. Please take time to read the following information sheet carefully. If you have any questions or would like more information, ask the interviewer or contact us using the detail given at the end of this leaflet.

WHAT IS THE PURPOSE OF THE STUDY?
HIV remains high in South Africa, especially amongst young people despite the existence of different HIV prevention methods such as condoms. Some of the existing methods such as condoms however do not give women control over HIV prevention. New HIV prevention methods such as the ring, monthly injection or monthly pill are currently under investigation. Although these new methods are being developed, how these products are delivered to the users is very important in ensuring the success of the method. It is therefore important to understand students' preferences for delivery of these long-acting PrEP methods. Since these methods are still being developed, you may not know about them, we will start by asking about methods used to prevent pregnancy or other HIV prevention methods such as use of a daily pill to prevent HIV and what they like about the product or way the service is delivered.

We therefore seek to understand more about how individuals prefer new long-acting PrEP formulations to be delivered to them. We are particularly interested in knowing, where they prefer to get the HIV prevention products from; gender of provider they prefer to provide them with the service, how they prefer to receive information about the methods, how they want service to be provided that is, face to face, through the phone or through a phone application and other characteristics of service delivery which they might value.

WHY HAVE I BEEN INVITED TO PARTICIPATE?
You have been invited to participate because you are studying at a university or technical and vocational training (TVET) college which is in Tshwane sub-district 1 and accessing sexual and reproductive health services either through Maria Rantho mobile health facility or through your campus clinic.

DO I HAVE TO TAKE PART?
Your participation in this study is entirely voluntary and you may refuse to participate or withdraw from the study at any time. This IDI will take 30-60 minutes of your time. The IDIs will be conducted on university/college campus where you are currently studying so that you will not incur any transport costs to

participate in the IDI. We will make arrangements for a quiet space to conduct the interviews to ensure your privacy. We will ask you to sign a consent sheet indicating that you agree to be part of the study. With your permission, we will audio-record the discussion, so that we can capture all that is said.

You have the right to make an informed decision whether or not to participate. Even if you decide to take part in the study, you may refuse to answer any questions or contribute to the interview if you feel uncomfortable.

You will not suffer any adverse consequences in the event of you refusing to take part in the study, withdrawing from the study or not answering all questions. Equally, choosing to take part in the study will not entitle you to any benefits.

WHAT ARE THE POSSIBLE DISADVANTAGES AND RISKS OF TAKING PART? (WHERE APPROPRIATE)
While there are no direct risks associated with participating in this study, it is possible that some issues discussed in the interview may remind you of some issues which happened in the past which may upset/stress you. In the event that you become stressed during the interview, we will link you to a registered counsellor who will provide counselling services to you free of charge. The details of the counsellor are provided below:

Name of counsellor: Kerry Gordon
Contact number: 011 358 5573

We also realize you may not want to respond to certain questions because they are of a sensitive nature. There will be no obligation to respond to all the questions posed by the researcher. You will not be named in any publication arising from this work.

WHAT ARE THE POSSIBLE BENEFITS OF TAKING PART?
The study does not involve any direct benefits to you. The benefits hoped for from this study, through your participation, is for researchers to better understand what students from tertiary institutions prefer regarding the delivery of long-acting PrEP services to inform delivery in South Africa.

REIMBURSEMENT
You will not incur any financial costs by participating in this study. You will however be reimbursed R50 for the time inconvenience resulting from participating in this study.

WILL MY INFORMATION IN THIS STUDY BE KEPT CONFIDENTIAL?
All the information collected is kept private and confidential. You will not be asked to use your real name in the IDIs, but you can use a fake name for the purposes of the interview. With your permission, what you say during the interview will be audio recorded and this will be written out and kept as a Word document which will be password protected. All the data will be kept on a secure computer using a study number not your name. Your identifiable information (such as your name) will be kept separately. In this way the data are locked so that researchers cannot link the information they are analyzing to named individuals. Researchers can be given permission to analyze the findings from this study and may also write about the findings in scientific journals to share the information that we learn with others in South Africa and the world. We take necessary measures to protect the identities of participants.

WHAT SHOULD I DO IF I WANT TO TAKE PART?
If you decide to take part in the study you will be given this information sheet by a study interviewer. You can either have the study interviewer read the information sheet to you or you can read it yourself. You will be given this information sheet to keep and will then be asked to provide your name, date and signature on a consent form.

WHAT WILL HAPPEN TO THE RESULTS OF THE RESEARCH STUDY?
Once the study has been completed, the information obtained from all participants will be collated and academic papers will be written and published in journal articles and some of the information will be presented at seminars or conferences. A PhD thesis will be written with the collected information. We will gladly provide you with a summary of the results on request. The information used for this publication cannot be traced back to you as it will be de-identified meaning that all information which may make it possible for people identify you will be removed.

WHO IS FUNDING THE RESEARCH?
This PhD is funded by the Consortium for Advanced Research Training in Africa (CARTA).

WHO HAS APPROVED THIS STUDY?

This study has been approved by the Human Research Ethics Committee (Medical) of the University of the Witwatersrand, Johannesburg ("Committee"). A principal function of this Committee is to safeguard the rights and dignity of all human subjects who agree to participate in a research project and the integrity of the research. If you have any concern over the way the study is being conducted, please contact the Chairperson of this Committee who is Dr Clement Penny, who may be contacted on telephone number 011 717 2301, or by e-mail on Clement.Penny@wits.ac.za. The telephone numbers for the Committee secretariat are 011 717 2700/1234 and the e-mail addresses are Zanele.Ndlovu@wits.ac.za and Rhulani.Mukansi@wits.ac.za

CONTACT FOR FURTHER INFORMATION
In the event of any problems, concerns or questions you may contact the Chair/s of the Ethics Committee that has reviewed the study or the study team using the following details:

Student
Patience Shamu
University of the Witwatersrand
Wits Reproductive Health and HIV Institute
8 Blackwood Avenue, Parktown, Johannesburg, South Africa
Tel: 011 358 5677
Email: pshamu@wrhi.ac.za

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Supervisor
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Wits Reproductive Health and HIV Institute
Director, Implementation Science
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Tel: 011 358 5677
Email: smullick@wrhi.ac.za

THANK YOU FOR TAKING THE TIME TO READ THIS INFORMATION SHEET

10.3 Appendix C. FGD Participant Information Sheet

PARTICIPANT INFORMATION SHEET – FOCUS GROUP DISCUSSION

STUDY TITLE
Preferences for service delivery for long-acting HIV Pre-Exposure Prophylaxis formulations among students in tertiary institutions in South Africa: A Discrete Choice Experiment

INVITATION PARAGRAPH

Good day!

My name is Patience Shamu. I'm a PhD student at Wits Reproductive Health and HIV Research Institute (WRHI) of the University of the Witwatersrand, Johannesburg.

We would like to invite you to consider participating in a Focus Group Discussion (FGD) regarding preferences for delivery of new long-acting HIV prevention methods (Pre-Exposure Prophylaxis [PrEP]) which are still being developed. These new methods involve use of some of the medicines used for HIV treatment, known as antiretroviral drugs (ARVs) to prevent HIV among people who do not have the virus. The long-acting methods include the dapivirine vaginal ring, also known as the PrEP ring for preventing HIV among women. Other methods include PrEP given through an injection either every 2 months (cabotegravir), or 6 months, with an ARV called lenacapavir and also a monthly pill called Islatravir. Since these methods are not yet available, we will ask you about your thoughts with regards to the use of long-acting HIV Prevention methods and how best you think these methods should be delivered when they become available.

Before you decide whether or not to take part, it is important for you to understand why the research is being done and what it will involve. Please take time to read this information sheet carefully.

WHAT IS THE PURPOSE OF THE STUDY?
The purpose of this study is to understand students' preferences for delivery of these long-acting methods of preventing HIV. We will start by asking you about methods used to prevent pregnancy or other HIV prevention methods such as use of daily pills to prevent HIV and what you like about the product or way the service is delivered. We would also like to understand your views towards the way contraceptive services are offered to young people and if there are any frustrations with the current services. A Focus Group is a small group of people brought together to discuss a particular topic.

We would like to understand more about how individuals would prefer the new methods to be delivered to them, where they prefer to get their new HIV prevention technologies from; gender of provider they prefer to provide them with the service, how they prefer to receive information about long-acting PrEP methods, where and how they prefer to test for HIV and how they want services to be provided ie face to face, through the phone or through a phone application and any other characteristics of service delivery that they value. This information will be used to develop a survey, which will be used to measure the strength of these preferences.

WHY HAVE I BEEN INVITED TO PARTICIPATE?
You have been invited to participate because you are studying at a university or technical and vocational training college in Tshwane sub-district 1 and receiving sexual and reproductive health services either through the Maria Rantho mobile health facility or through your campus clinic.

DO I HAVE TO TAKE PART?

Your participation in this study is entirely voluntary and you may refuse to participate or withdraw from the study at any time. Participating in this FGD will take about 1.5 – 2hours hours of your time. The FGDs will be conducted either on university/college campuses or community health centres which are within your reach meaning that you will not incur any transport costs to participate in the FGD. Individual participants are asked not to identify themselves or other members by name during the discussion. We will ask you to sign a Consent Sheet indicating that you agree to be part of the study. Anonymity cannot be guaranteed in a FGD as some of the participants may recognize one another, but we do ask that you regard the discussion as confidential,

not to be repeated after it finishes. With your permission, we will audio-record the discussion, so that we can capture all that is said. Individual participants are asked not to identify themselves or other members by name during the discussion.

VOLUNTARY PARTICIPATION

You have the right to make an informed decision whether or not to participate. Even if you decide to take part in the study, you may refuse to answer any questions or contribute to the discussion if you feel uncomfortable. For the focus group discussion, it will not be possible to withdraw data once it has been given and the researchers will retain any data provided up to the point of withdrawal as contributions from other group members may be dependent on what has been said.

You will not suffer any adverse consequences in the event of your refusing to take part in the study, withdrawing from the study or not answering all questions. Equally, choosing to take part in the study will not entitle you to any benefits.

WHAT WILL HAPPEN TO ME IF I TAKE PART?

If you decide to take part in the study, you will be given this information sheet by a study interviewer. You can either have the study interviewer read the information sheet to you or you can read it yourself. You will be given this information sheet to keep and will then be asked to provide your name, date and signature on a consent form. We may contact you again to request you to participate in a workshop (nominal group discussion)

At the beginning of the FGD, we will start by showing you videos of long-lasting methods of preventing HIV using ARVs, which are still being developed. In addition, we will also show you some printed materials which provide information on how these methods work. We will also show you samples of the PrEP ring so that you can touch and feel it before we start talking about it, in addition to the other methods.

In the FGD, we will start by asking you some questions related to the use of contraception among young women and also your thoughts concerning HIV prevention methods. We will then check your willingness to use the new methods, your concerns towards use of these new methods and also how you would want these methods to be delivered to you when they finally become available.

WHAT ARE THE POSSIBLE DISADVANTAGES AND RISKS OF TAKING PART? (WHERE APPROPRIATE)

There are no direct risks associated with participating in this study. However, we realize you may not want to respond to certain questions because they are of a sensitive nature. There will be no obligation to respond to all the questions posed by the researcher. You will not be named in any publication arising from this work.

WHAT ARE THE POSSIBLE BENEFITS OF TAKING PART?

The study does not involve any direct benefits to you. The benefits hoped for from this study, through your participation, is for researchers to better understand what students from tertiary institutions prefer regarding the delivery of services to provide long –acting PrEP methods. In addition, the information will inform delivery of long-acting PrEP methods in South Africa.

REIMBURSEMENT

You will not incur any financial costs by participating in this study. You will however be reimbursed R50 for the time inconvenience resulting from participating in this study.

WILL MY INFORMATION IN THIS STUDY BE KEPT CONFIDENTIAL?

While confidentiality cannot be guaranteed especially in FGDs, strict measures will be taken to protect your identity You will not be asked to use your real name in the FGDs, but you can use a fake name for the purposes of the interview. With your permission, what you say during the interview will be audio recorded and this will be written out and kept as a Word document which will be password protected. All the data will be kept on a secure password protected computer using a study number not your name. Your identifiable information (such as your name) will be kept separately. In this way the data are locked so that researchers cannot link the information they are analyzing to named individuals. The research team can be given permission to analyse the findings from this study and may also write about the findings in scientific journals to share the information with the world.

All data collected during the study will be securely retained for two (2) years, if a scientific publication arises from the study and six (6) years, if there is no publication. Thereafter it will be destroyed accordingly.

WHAT WILL HAPPEN TO THE RESULTS OF THE RESEARCH STUDY?
Once the study has been completed, the information obtained from all participants will be put together and academic papers will be written and published in journal articles and some of the information will be presented at seminars or conferences. A PhD thesis will be written with the collected information. We will gladly provide you with a summary of the results on request. The information used for this publication cannot be traced back to you as it will be de-identified meaning that all information which may make it possible for people identify you will be removed

WHO IS FUNDING THE RESEARCH?
This PhD is funded by the Consortium for Advances Research Training in Africa (CARTA).

WHO HAS APPROVED THIS STUDY?

This study has been approved by the Human Research Ethics Committee (Medical) of the University of the Witwatersrand, Johannesburg ("Committee"). A principal function of this Committee is to safeguard the rights and dignity of all human subjects who agree to participate in a research project and the integrity of the research. If you have any concern over the way the study is being conducted, please contact the Chairperson of this Committee who is Dr Clement Penny, who may be contacted on telephone number 011 717 2301, or by e-mail on Clement.Penny@wits.ac.za. The telephone numbers for the Committee secretariat are 011 717 2700/1234 and the e-mail addresses are Zanele.Ndlovu@wits.ac.za and Rhulani.Mukansi@wits.ac.za

CONTACT FOR FURTHER INFORMATION
In the event of any problems, concerns or questions, you may contact the Chair/s of the Ethics Committee that has reviewed the study or the Principal Investigator of the study using the following details:

Patience Shamu [PhD candidate]
8 Blackwood Avenue
Parktown
Johannesburg,
South Africa
Tel: 011 358 5300
Email: pshamu@wrhi.ac.za

Prof Saiqa Mullick [Supervisor]
8 Blackwood Avenue, Parktown,
Johannesburg
South Africa
Tel: 011 358 5677
Email: smullick@wrhi.ac.za

THANK YOU FOR READING THIS STUDY INFORMATION SHEET

10.4 Appendix D. NGD Participant Information Sheet

PARTICIPANT INFORMATION SHEET - NOMINAL GROUP DISCUSSION

STUDY TITLE
Preferences for service delivery for long-acting HIV Pre-Exposure Prophylaxis formulations among students in tertiary institutions in South Africa: A Discrete Choice Experiment

INVITATION PARAGRAPH

Good day!

We would like to invite you to take part in a Nominal Group Discussion (NGD) for a research study looking at young women's preferences for delivery of services for new long-acting HIV prevention methods known as Pre-Exposure Prophylaxis (PrEP) which are still being developed.

Before you decide whether or not to take part, it is important for you to understand why the research is being done and what it will involve. Please take time to read the following information sheet carefully. If you have any questions or would like more information, ask the interviewer, or contact us using the detail given at the end of this leaflet.

WHAT IS THE PURPOSE OF THE STUDY?
The aim of this nominal group discussion/workshop is to identify the characteristics of services used to distribute long-acting PrEP that are preferred by young women who are students in this case. This information will inform the rollout of different forms of long-acting PrEP which we discussed in the focus group discussions you recently attended. These methods include the dapivirine vaginal ring (DVR) which we will refer to as the ring going forward and injectable forms of PrEP, where one gets a shot every 2 months and another one for every 6 months, which we will refer to as the injection. In addition, it will also inform the delivery of an oral monthly pill for HIV prevention, called Islatravir which we will refer to as the pill. At the end of the workshop, we will have identified characteristics of service delivery you value most which you think will be important in the delivery of these new long-acting PrEP methods. A nominal group discussion is a small group of people brought together to discuss a particular question or two and they reach a final decision by agreement.

WHY HAVE I BEEN INVITED TO PARTICIPATE?
You have been invited to participate because you recently participated in a Focus Group Discussion where different characteristics of delivery of new long-acting PrEP methods were discussed.

DO I HAVE TO TAKE PART?
Your participation in this study is entirely voluntary and you may refuse to participate or withdraw from the study at any time. You have the right to make an informed decision whether or not to participate

You will not suffer any adverse consequences in the event of you refusing to take part in the study, withdrawing from the study or not answering all questions. Equally, choosing to take part in the study will not entitle you to any benefits.

WHAT WOULD I BE ASKED TO DO IF I WANT TO TAKE PART?
You will be asked to take part in a nominal group discussion which can also be called a workshop. In this discussion you will be asked to participate in a brainstorming session where you will be asked to write down characteristics of service delivery of the long-acting PrEP forms you value on a piece of paper without discussing with anyone. You will also be asked to write down the different options/levels for the characteristics you would have written down, without discussing with your peers. After this exercise you will also be asked to participate in a group discussion. There will be 3 groups of about 5 participants per group. After discussing

we will also ask you to rank these characteristics in order of importance and we will do the final ranking and reach our final list by agreement where the 3 groups will be brought together in one room for the ranking exercise.

Participating in this NGD will take 1.5-2 hours of your time. The NGD will be conducted either on university/college campuses or community health centres which are within your reach depending on where we would have secured a suitable place for conducting the interviews.

WHAT ARE THE POSSIBLE DISADVANTAGES AND RISKS OF TAKING PART? (WHERE APPROPRIATE)
There are no direct risks associated with participating in this study. However, we realize you may not want to respond to certain questions. There will be no obligation to respond to all the questions posed by the researcher. You will not be named in any publication arising from this work.

WHAT ARE THE POSSIBLE BENEFITS OF TAKING PART?
The study does not involve any direct benefits to you. The benefits hoped for from this study, through your participation, is for researchers to better understand what students from tertiary institutions prefer regarding the delivery of services to provide long–acting PrEP methods. In addition, the information will inform delivery of long-acting PrEP methods in South Africa.

REIMBURSEMENT
You will not incur any financial costs by participating in this study. You will however be reimbursed with a voucher worth R50 for the time inconvenience resulting from participating in this study.

WILL MY INFORMATION IN THIS STUDY BE KEPT CONFIDENTIAL?
While confidentiality cannot be guaranteed especially in group discussion, strict measures will be taken to protect your identity. You will not be asked to use your real name in the group discussions, but you can use a fake name for the purposes of the workshop. Your identifiable information (such as your name) will be kept separately. In this way the data are locked so that researchers cannot link the information they are analyzing to named individuals. Researchers can be given permission to analyse the findings from this study and may also write about the findings in scientific journals to share the information with the world.

WHAT SHOULD I DO IF I WANT TO TAKE PART?
If you decide to take part in the study, you will be given this information sheet by the study team. You can either have the study interviewer read the information sheet to you or you can read it yourself. You will be given this information sheet to keep and will then be asked to provide your name, date, and signature on a consent form to indicate that you agree to participate in the study. With your permission, we will audio-record some parts of the discussion, so that we can capture all that is said. Individual participants are asked not to identify themselves or other members by name during the discussion.

WHAT WILL HAPPEN TO THE RESULTS OF THE RESEARCH STUDY?
Once the study has been completed, the information obtained from all participants will be put together and used to develop a survey tool. This will be used to measure the strength of young women's preferences for different service delivery characteristics. Academic papers will also be written and published in journal articles and some of the information will be presented at seminars or conferences. A PhD thesis will be written with the collected information. We will gladly provide you with a summary of the results on request. We may use some direct quotes from the discussion, without any information that could identify you in the research report or other write-ups of research. The information used for this publication cannot be traced back to you. All data collected during the course of the study will be securely retained for two (2) years, if a scientific publication arises from the study and six (6) years, if there is no publication. Thereafter it will be destroyed accordingly.

WHO IS FUNDING THE RESEARCH?
This PhD is funded by the Consortium for Advanced Research Training in Africa (CARTA).

WHO HAS APPROVED THIS STUDY?

This study has been approved by the Human Research Ethics Committee (Medical) of the University of the Witwatersrand, Johannesburg ("Committee"). A principal function of this Committee is to safeguard the rights and dignity of all human subjects who agree to participate in a research project and the integrity of the research. If you have any concern over the way the study is being conducted, please contact the Chairperson of this Committee who is Professor Clement Penny, who may be contacted on telephone number 011 717 2301, or by e-mail on Clement.Penny@wits.ac.za. The telephone numbers for the Committee secretariat are 011 717 2700/1234 and the e-mail addresses are Zanele.Ndlovu@wits.ac.za and Rhulani.Mukansi@wits.ac.za

CONTACT FOR FURTHER INFORMATION
In the event of any problems, concerns or questions you may contact the Chair/s of the Ethics Committee that has reviewed the study or the Principal Investigator of the study using the following details:

Patience Shamu [PhD Candidate]
8 Blackwood Avenue, Parktown, Johannesburg, South Africa
Tel: 011 358 5300
Email: pshamu@wrhi.ac.za

Prof. Saiqa Mullick [Supervisor]
8 Blackwood Avenue, Parktown, Johannesburg, South Africa
Tel: 011 358 5677
Email: smullick@wrhi.ac.za

Prof Nicola Christofides
8 York Road, Park Town, Johannesburg
Tel: 0117172566
Email: Nicola.Christofides@wits.ac.za

THANK YOU FOR TAKING YOUR TIME TO READ THIS INFORMATION SHEET

10.5 Appendix E. IDI Informed Consent Form

PARTICIPANT CONSENT SHEET- IN-DEPTH INTERVIEW

STUDY TITLE
Preferences for service delivery for long-acting HIV Pre-Exposure Prophylaxis formulations among students in tertiary institutions in South Africa: A Discrete Choice Experiment

I have been given a Participant Information Sheet which explains the nature and processes involved in this study, which is attached hereto;

I understand the purpose and procedures of the study as per the Participant Information Sheet and agree to take part in this study;

I was given time to read it, or had it read to me, in the language I best understand;

I have been given an opportunity to ask questions about the study and have had answers to my satisfaction;

I believe I fully understand why the study is being conducted and what the intended outcomes will be;

I declare that my participation in this study is entirely voluntary and that I may withdraw at any time without affecting my care at this or any other facility;

I consent to the processing of my personal information and data for the purposes of this research study. I understand that such information will be treated as strictly confidential and handled in accordance with the Protection of Personal Information Act (2013);

I understand that confidentiality cannot be guaranteed for information which I might disclose during the interview;

I also understand that I am not giving up any of my legal rights by signing this informed consent document;

I have been given a range of contact details, listed below. If I require further information or become concerned about any aspect of this study, I am free to speak to any of these contacts.

If I have any further questions/concerns or queries related to the study I understand that I may contact Patience Shamu, telephone 011 358 5300
Professor Saiqa Mullick (supervisor), Tel: 011 358 5600, email: smullick@wrhi.ac.za

If you have any concern over the way the study is being conducted, please contact the Chairperson of the Ethics Committee of The University of the Witwatersrand, Johannesburg, who is Dr Clement Penny, who may be contacted on telephone number 011 717 2301, or by e-mail on Clement.Penny@wits.ac.za. The telephone numbers for the Committee secretariat are 011 717 2700/1234 and the e-mail addresses are Zanele.Ndlovu@wits.ac.za and Rhulani.Mukansi@wits.ac.za

I hereby provide my written consent:

Name of Participant	Signature of Participant	Date
Name of Data Collector	Signature of Data Collector	Date

1

10.6 Appendix F. FGD Informed Consent Form

PARTICIPANT CONSENT SHEET - FOCUS GROUP DISCUSSION

STUDY TITLE
Preferences for service delivery for long-acting HIV Pre-Exposure Prophylaxis formulations among students in tertiary institutions in South Africa: A Discrete Choice Experiment

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I _____ (participant name)

have been informed about the study entitled: Preferences for service delivery for long-acting HIV Pre-Exposure prophylaxis formulations among students in tertiary institutions in South Africa: A Discrete Choice Experiment

_____ (name of researcher/fieldworker).

I have been given a Participant Information Sheet which explains the nature and processes involved in this study, which is attached hereto;

I was given time to read it, or had it read to me;

I have been given an opportunity to ask questions about the study and have had answers to my satisfaction;

I believe I fully understand why the study is being conducted and what the intended outcomes will be;

I understand that, even if I initially consent to take part in the study, I may subsequently withdraw my participation at any time and would not be required to give any reasons; if that happened, any data collected about me for the purposes of the study would immediately be destroyed, unless I give consent for it to be retained

I consent to the processing of my personal information and data for the purposes of this research study. I understand that such information will be treated as strictly confidential and handled in accordance with the Protection of Personal Information Act (2013)

I understand that confidentiality cannot be guaranteed for information which I might disclose during the interview;

I also understand that I am not giving up any of my legal rights by signing this informed consent document.

I agree to be contacted in future to participate in a workshop – Yes/No [Delete the inapplicable]

If I have any further questions/concerns or queries related to the study I understand that I may contact Patience Shamu, telephone 011 358 5300, email:pshamu@wrhi.ac.za
Professor Saiqa Mullick (supervisor), Tel: 011 358 5600, email: smullick@wrhi.ac.za

If you have any concern over the way the study is being conducted, please contact the Chairperson of the Ethics Committee of The University of the Witwatersrand, Johannesburg, who is Professor Clement Penny, who may be contacted on telephone number 011 717 2301, or by e-mail on Clement.Penny@wits.ac.za. The telephone numbers for the Committee secretariat are 011 717 2700/1234 and the e-mail addresses are Zanele.Ndlovu@wits.ac.za and Rhulani.Mukansi@wits.ac.za

1

I hereby provide my written consent:

Name of Participants	Signature of Participant	Date

Name of Witness	Signature of Witness	Date

Investigator or person who conducted Informed Consent discussion:
I confirm that I have personally explained the nature and extent of the planned research, study procedures, potential risks and benefits, and confidentiality of personal information.

Name of person obtaining consent: _____

Signature of person obtaining consent: _____ Date: _____

10.7 Appendix G. NGT Informed Consent Form

PARTICIPANT CONSENT SHEET - NOMINAL GROUP DISCUSSION

STUDY TITLE
Preferences for service delivery for long-acting HIV Pre-Exposure Prophylaxis formulations among students in tertiary institutions in South Africa: A Discrete Choice Experiment

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I _____ (participant name)

have been informed about the study entitled: Preferences for service delivery for long-acting HIV Pre-Exposure prophylaxis formulations among students in tertiary institutions in South Africa: A Discrete Choice Experiment

_____(name of researcher/fieldworker).

I have been given a Participant Information Sheet which explains the nature and processes involved in this study, which is attached hereto;

I was given time to read it, or had it read to me;

I have been given an opportunity to ask questions about the study and have had answers to my satisfaction;

I believe I fully understand why the study is being conducted and what the intended outcomes will be;

I understand that, even if I initially consent to take part in the study, I may subsequently withdraw my participation at any time and would not be required to give any reasons; if that happened, any data collected about me for the purposes of the study would immediately be destroyed, unless I give consent for it to be retained

I consent to the processing of my personal information and data for the purposes of this research study. I understand that such information will be treated as strictly confidential and handled in accordance with the Protection of Personal Information Act (2013) ;

I understand that confidentiality cannot be guaranteed for information which I might disclose during the interview;

I also understand that I am not giving up any of my legal rights by signing this informed consent document.

If I have any further questions/concerns or queries related to the study I understand that I may contact Patience Shamu, telephone 011 358 5300, email:pshamu@wrhi.ac.za
Professor Saiqa Mullick (supervisor), Tel: 011 358 5600, email: smullick@wrhi.ac.za

If you have any concern over the way the study is being conducted, please contact the Chairperson of the Ethics Committee of The University of the Witwatersrand, Johannesburg, who is Professor Clement Penny, who may be contacted on telephone number 011 717 2301, or by e-mail on Clement.Penny@wits.ac.za. The telephone numbers for the Committee secretariat are 011 717 2700/1234 and the e-mail addresses are Zanele.Ndlovu@wits.ac.za and Rhulani.Mukansi@wits.ac.za

1

I hereby provide my written consent:

Name of Participants	Signature of Participant	Date

Name of Witness	Signature of Witness	Date

Investigator or person who conducted Informed Consent discussion:
I confirm that I have personally explained the nature and extent of the planned research, study procedures, potential risks and benefits, and confidentiality of personal information.

Name of person obtaining consent: _____

Signature of person obtaining consent: _____ Date: _____

10.8 Appendix H. IDI Audio-Recording Consent Form

CONSENT FORM FOR AUDIO RECORDING OF IN-DEPTH INTERVIEW

STUDY TITLE

Preferences for service delivery for long-acting HIV Pre-Exposure Prophylaxis formulations among students in tertiary institutions in South Africa: A Discrete Choice Experiment

I hereby consent to audio recording of the in-depth interview

I understand that:

- The recording will be stored in a secure location (a locked cupboard or password protected computer) with restricted access to the researcher and the research supervisor.
- The recording will be transcribed and any information that could identify me will be removed,
- The recordings will be erased within either (a) two (2) years of the publication of the research findings, or (b) six (6) years, if no publications arise from this research
- Anyone wishing to access this information in the future will first have to obtain the approval of the Human Research Ethics Committee (Medical) of the University of the Witwatersrand, Johannesburg
- Direct quotes from my interview, without any information that could identify me, may be cited in the research report or other write-ups of research.

Name of Participant: _____

Date: _____

Place: _____

Signature or mark _____

Witnessed by:

Name of Witness: _____

Signature: _____

1

Date: _____

10.9 Appendix I: Focus Group Discussion Audio-Recording Consent Form

STUDY TITLE

Preferences for service delivery for long-acting HIV Pre-Exposure Prophylaxis formulations among students in tertiary institutions in South Africa: A Discrete Choice Experiment

I hereby consent to the audio recording of the Focus Group Discussion

I understand that:

- The recording will be stored in a secure location (a locked cupboard or password-protected computer) with restricted access to the researcher and the research supervisor.
- The recording will be transcribed, and any information that could identify me will be removed;
- The recordings will be erased within either (a) two (2) years of the publication of the research findings, or (b) six (6) years, if no publications arise from this research
- Anyone wishing to access this information in the future will first have to obtain the approval of the Human Research Ethics Committee (Medical) of the University of the Witwatersrand, Johannesburg;
- Direct quotes from my interview, without any information that could identify me, may be cited in the research report or other write-ups of research.

Name of Participant: _____
Date: _____
Place: _____
Signature or mark _____

Witnessed by:
Name of Witness: _____
Signature: _____
Date: _____

Name of data collector: _____
Date: _____

10.10 Appendix J. Nominal Group Discussion Audio Recording

Consent

STUDY TITLE

Preferences for service delivery for long-acting HIV Pre-Exposure Prophylaxis formulations among students in tertiary institutions in South Africa: A Discrete Choice Experiment

CONSENT FORM FOR AUDIO RECORDING OF STUDY PARTICIPATION

I hereby consent to audio recording of the nominal group discussion

I understand that:

- The recording will be stored in a secure location (a locked cupboard or password protected computer) with restricted access to the researcher and the research supervisor.
- The recording will be transcribed and any information that could identify me will be removed,
- The recordings will be erased within either (a) two (2) years of the publication of the research findings, or (b) six (6) years, if no publications arise from this research
- Anyone wishing to access this information in the future will first have to obtain the approval of the Human Research Ethics Committee (Medical) of the University of the Witwatersrand, Johannesburg
- Direct quotes from my interview, without any information that could identify me, may be cited in the research report or other write-ups of research.

Name of Participant: _____
Date: _____
Place: _____
Signature or mark _____

Witnessed by:
Name of Witness: _____
Signature: _____
Date: _____

10.11 Appendix K. IDI Guide

8	What do you think could be improved concerning the delivery of the service?	
9.	How has the COVID-19 pandemic affected your use of contraceptives? Please explain	Where to get contraceptives, how to get them and the type used?
Section C: PrEP		
10	Have you heard of oral PrEP?	How did you learn about oral PrEP?
11	What have you heard about oral PrEP and how it works?	
12	Have you ever used oral PrEP? If so, what have your experiences with using it been?	Probe about: • Challenges with taking a daily pill • Adherence • Side effects • Challenges with access • Quality of care when initiated onto PrEP/follow-up appointments • Stigma • Discrimination • Disclosure • What did your family think about it? • What were your friends' thoughts about your use of PrEP? • What were your sexual partners' responses to it? • Any other experiences at social or community levels?
13	(a) Have you heard of long-acting PrEP methods? (b) What have you heard about the new methods?	• Which methods have you heard about? (*If not specifically mentioned, probe about:* - ring, monthly injection, monthly pill, implant) [*Facilitator to provide guidance on ring, injection, and monthly pill with support materials (including effectiveness of products, how they are used, how long it should be taken, etc.)*
14	What do you think about your risk of HIV infection? Please explain your response.	
Section D: Willingness to use new HIV Prevention methods being developed		
15	Should these new HIV prevention methods become available, would you be willing to use them?	• Ring? • Monthly oral PrEP? • Injection? • Implant?
16	Which methods would you prefer to use among the different PrEP methods? Please rank them from most to least preferred.	• Ring? • Daily oral PrEP? • Monthly oral PrEP? • Injection? • Implant? Probe about motivations for ranking. Concerns about safety, fear of pain when administered, greater chance of stigma, cost, time, anticipated difficulties getting access
Section E: Social and community concerns		
17		Probe

	Do you think you will disclose use of new HIV prevention method?	• Partner • Friends • Family
18	How do you think your sexual partner/s will respond to your use of these methods?	
19	How will your friends respond? (a) family members you live with? (b) Family members not in the same household with you?	
20	How will these responses influence your decision to use them or not? (i.e. will they become barriers or facilitators to use?)	

I have come to the end of my questions. Is there anything you would like to add or ask before we close?

Thank you for your time and contributions

10.12 Appendix L. FGD guide

Preferences for service delivery for long-acting HIV Pre-exposure prophylaxis formulations among students in tertiary institutions in South Africa: A Discrete Choice Experiment

Focus Group Discussion Guide

Introduction		
My name is Patience Shamu. I am a PhD student at the University of the Witwatersrand's Wits Reproductive Health and HIV Institute. Thank you for participating in this Focus Group Discussion (FGD) In this FGD session, a range of topics will be covered. I am interested to know about students' perceptions of using different HIV prevention and contraceptive methods. The HIV prevention methods we will discuss include use of oral PrEP (daily pill), the dapivirine vaginal ring (DVR) and other new HIV Prevention methods, which are still being developed. I will show you a video which shows how DVR works, and show you a sample of the DVR so that you can touch and feel it before we can start talking about it. I will also show you pamphlets with information on the other new PrEP methods before we start talking about these methods. Please note that there are no right or wrong answers, so feel free to say what you think.	
Section A. Contraceptive use		
#	Questions	Probes
1	I'm interested to know about contraceptive use by students like yourselves. Which methods do they tend to use?"	Methods they are using and reasons for their choices
2	(a) Where do students get contraceptives from? (b) Does this change during college/university vacations? Please explain your response.	Why they get contraceptives from the place they mention e.g, campus clinic, pharmacy, campus or community clinic Probes: distance to the facility, waiting time, provider attitude, quality of service
3	How has the COVID-19 pandemic affected your use of contraceptive services?	Probes: where to access, availability, periods of non-use, how and what method to use
4	What challenges do you and your friends face in accessing contraceptive services?	Probes: Frustrations with service • service provider attitudes • waiting time • privacy • quality of service • stock outs
5	What are the opinions of partners on young women/students using contraceptives? (b) family members opinions? c) community members opinions ?	Are they supportive or not supportive?

1

	Section B: Knowledge of HIV Prevention methods	
6	There are different methods of preventing HIV. Which prevention methods do you know of?	
7	Have you heard of oral PrEP? What have you heard about it?	
8	Have you heard of other new ARV-based long-acting methods of preventing HIV? What have you heard about it?	[Facilitator to provide guidance on new long-acting PrEP technologies with support materials (including effectiveness of products, how they are used, how long they should be taken for and how etc.)]
Section C: Perceptions of different HIV Prevention methods		
9	What do you think of different HIV prevention methods in terms ease of use? (b) accessibility to students? (c) acceptability among students	• Oral PrEP? • Ring? • Injection? • Condom? • Implant?
Section D: Willingness and ability to use new products		
10	Should the new products I have just explained to you become available, would you be willing to use them?	• Ring? • Daily oral PrEP? • Injection? • Implant [Probe]
11	Which methods would you prefer to use among the different prevention methods? Please rank them from most to least preferred.	• Ring? • Daily oral PrEP? • Injection? • Implant Probe motivation for ranking
12	What could be the reason why you may not be able to use some of these new products?	Opposition from partner, family, or community? Previous experience with HIV prevention methods eg PrEP Other reasons?
13	(a) Who usually makes decisions about reproductive health care for you? Please explain. (b) How do you compare your partner's involvement in making a decision for contraceptive use to their involvement in HIV prevention decisions?	You, partner, joint decision [partner and self-], or someone else?
Section E: Social and community concerns		
14	Would you tell your partner (s) about the HIV prevention method you are using?	

15	How do you think your sexual partners will respond to your use of these methods?	
16	How will your friends and family members respond?	
17	How will these responses influence your decision to use them or not? (i.e. will they become barriers or facilitators of use?)	
18	Could these methods end up becoming stigmatised?	How?
Section F: Service delivery preferences for new PrEP methods		
19	**Place of dissemination** Where would you prefer to get the new HIV prevention methods when they become available?	Eg fixed clinic, hospital, mobile clinic pharmacy, somewhere else Why do you prefer these places for the methods to be disseminated?
20	**The person who dispenses new PrEP methods** Which service provider/s would you prefer to receive the new HIV prevention methods from and why?	Pharmacists, nurses, doctors, peer educators?
21	**Delivery channel** How do you think new HIV prevention methods should be delivered?	E.g. Face to face Tele-medicine, Self-management (digital)
22	**HIV Testing** Before starting a new HIV prevention method, clients are usually asked to have an HIV test. Where would you want to be tested for HIV?	At the facility, mobile facility, or self-testing at home Why?
23	**Communication about new PrEP methods** How would you like to receive information about new PrEP methods Please explain why?	e.g. Campus radio, campus magazine, mobile application
	Final Remarks	
24	Is there anything else that you would like to let us know with regards to service delivery before the rollout of the new PrEP methods?	

I have come to the end of my questions. Thank you very much for your time and contributions.

10.13 Appendix M. Nominal Group Discussion Guide

Nominal Group Discussion Guide

STUDY TITLE
Preferences for service delivery for long-acting HIV Pre-exposure prophylaxis formulations among students in tertiary institutions in South Africa: A Discrete Choice Experiment

My name is Patience Shamu. I am a PhD student at the University of the Witwatersrand, in the Wits Reproductive Health and HIV Institute department. I would like to thank you all for attending this workshop on data collection. I welcome you to this workshop, and I am very happy to have each of you here today. The aim of this workshop is to understand how you think we should distribute long-acting Pre-Exposure Prophylaxis (PrEP) for HIV prevention. We want to know what aspects of the delivery of PrEP are most important. We discussed these new long-acting PrEP methods in the focus group discussion (FGD) which you attended recently. This information will help to inform the rollout long-acting PrEP such as the dapivirine vaginal ring (DVR) which we will refer to as the ring going forward and also other long-acting PrEP methods like injections or pills.

At the end of this workshop, we will have identified characteristics of service delivery you value most in the delivery of the new long-acting HIV prevention methods which we talked about in the FGD.

In our workshop, it is important that each of us fully participates as its success will depend on our equal and full participation. I appreciate, therefore, the willingness of every one of you to fully share your ideas on characteristics of service delivery you think would be important for the successful rollout of long-acting PrEP. The ideas which you generate in this meeting will become the basis for developing the questions for a survey (discrete choice experiment) which we will use to measure the strength of young women's preferences for service delivery of these methods of HIV prevention.

What to expect in the workshop?

1) We will start by dividing into three groups so that you can have a discussion there will be a facilitator for each of the discussions. Remember that we are interested in your opinion and there are no right or wrong answers.
2) The facilitator/note-taker will write up the key things that the group comes up with.
3) ***Generating ideas***: You will be asked to write down the characteristics of a service you value as an individual without discussing with your friends
4) ***Recording ideas***: The facilitator (study team member) will ask you to say out your ideas and write them down on a flip chart
5) ***Discussing the ideas***: We will then discuss each of the listed ideas on the flip chart. The purpose of this discussion is to clarify the meaning of each item on our flip chart. It is also to express our understanding and logic of each idea and the relative importance of each item. Please feel free to disagree or express

varying points. The person who creates an idea should not feel obliged to explain the idea.

6) ***Voting on ideas***: In this session you will be asked to vote privately on priority of ideas and the group decision will be based on these ratings.
7) Each of the three groups will report back to the combined group and the process of discussing and voting on the ideas will be done again until a list of service delivery attributes and the levels has been reached by consensus.
8) Each of the three groups will choose a representative to report back to the bigger group with the rest of the group assisting where necessary.

Questions

1) How would you like to access long-acting PrEP such as the ring, injections and monthly oral pill?
   a. Place?
   b. Provider?
   c. Timing? (What is acceptable)
   d. Cost? (What is acceptable)
2) You have mentioned several places/providers? Could you say more about the reasons why you said _____ [insert the places, providers, timing, etc]

Once the discussion has exhausted the topics, take a break for 15 minutes

The facilitators will consolidate the attributes on a single flipchart

Ask the participants to place a sticker (each person should have a maximum of 5 stickers) next to their top attributes.

Count up which ones received the most stickers and then facilitate a discussion with the larger group:

We see that these are the top five aspects of how you would like PrEP to be delivered. Would anyone like to comment on whether one of the others should be in the top or not? Explain your reasons for wanting one of the others to be in the top.

Have a bigger discussion to confirm the top options

Thank you for participating in this workshop. Your valuable contributions will be used to inform the rollout of the new HIV prevention methods, which are still being developed.

Guide adapted from Dunham RB, PhD. Nominal Group Technique: a users' guide. 2006;1–5.

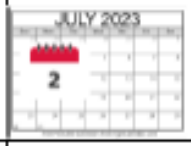
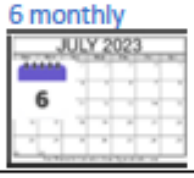
10.14 Appendix N. Images for DCE task

Final DCE Design

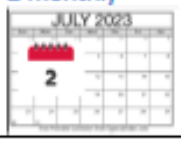
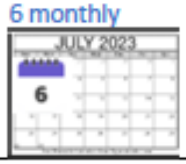
1. Which of these two PrEP services would you choose?

Characteristics of a service	Service A	Service B	Neither
1. How frequently you would go back to the health facility to get injectable PrEP?	2 monthly 	2 monthly 	
2. How would you like to be assisted should you have questions between appointments?	Return to the facility to see the healthcare provider 	Through an interactive App (Chatbot) 	
3. The location of this PrEP service	Public Clinic 	Public Clinic 	
4. The cost of this service	R150 	R100 	
5. The skills of the provider in the facility	A provider who is not a PrEP specialist 	A provider who is a PrEP specialist 	
6. The Provider sensitivity	A provider who is a good listener 	A provider who is not a good listener 	
7. The waiting time at this facility	1 hour 	30 minutes 	

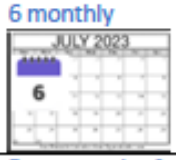
2. Which of these two PrEP services would you choose?

Characteristics of a service	Service A	Service B	Neither
1. How frequently you would go back to the health facility to get injectable PrEP?	2 monthly 	6 monthly 	
2. How would you like to be assisted should you have questions between appointments?	Return to the facility to see healthcare provider 	Return to the facility to see healthcare provider 	
3. The location of this PrEP service	Public Clinic 	Onsite campus clinic 	
4. The cost of this service	R150 	R100 	
5. The skills of the provider in the facility	A provider who specialises in PrEP 	A provider who is not a PrEP specialist 	
6. The Provider sensitivity	 A provider who is a good listener	A provider who is not a good listener 	
7. The waiting time at this facility	30 minutes 	1 hour 	

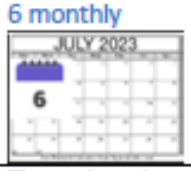
3. Which of these two PrEP services would you choose?

Characteristics of a service	Service A	Service B	Neither
1. How frequently you would go back to the health facility to get injectable PrEP?	2 monthly 	6 monthly 	
2. How would you like to be assisted should you have questions between appointments?	Through an interactive App (Chatbot) 	Through an interactive App (Chatbot) 	
3. The location of this PrEP service	Onsite campus clinic 	Public clinic 	
4. The cost of this service	 R150	 R50	
5. The skills of the provider in the facility	A provider who specialises in PrEP 	A provider who is not a PrEP specialist 	
6. The Provider sensitivity	A provider who is not a good listener 	A provider who is a good listener 	
7. The waiting time at this facility	1 hour 	1 hour 	

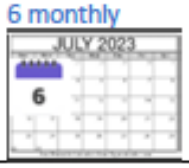
4. **Which of these two PrEP services would you choose?**

Characteristics of a service	Service A	Service B	Neither
1. How frequently you would go back to the health facility to get injectable PrEP?	2 monthly 	6 monthly 	
2. How would you like to be assisted should you have questions between appointments?	Through an interactive App (Chatbot) 	Return to the facility to see healthcare provider 	
3. The location of this PrEP service	Onsite campus clinic 	Public clinic 	
4. The cost of this service	R50 	Free 	
5. The skills of the provider in the facility	A provider who specialises in PrEP 	A provider who specialises in PrEP 	
6. The Provider sensitivity	A provider who is not a good listener 	A provider who is not a good listener 	
7. The waiting time at this facility	1 hour 	30 minutes 	

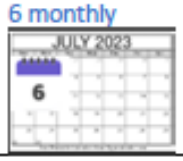
5. Which of these two PrEP services would you choose?

Characteristics of a service	Service A	Service B	Neither
1. How frequently you would go back to the health facility to get injectable PrEP?	6 monthly 	2 monthly 	
2. How would you like to be assisted should you have questions between appointments?	Through an interactive App (Chatbot) 	Return to the facility to see the health care provider 	
3. The location of this PrEP service	Onsite campus clinic 	Public clinic 	
4. The cost of this service	R50 	 Free	
5. The skills of the provider in the facility	A provider who is not a PrEP specialist 	A provider who is not a PrEP specialist 	
6. The Provider sensitivity	A provider who is a good listener 	A provider who is not a good listener 	
7. The waiting time at this facility	30 minutes 	1 hour 	

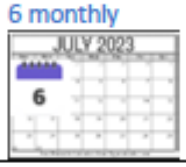
6. Which of these two PrEP services would you choose?

Characteristics of a service	Service A	Service B	Neither
1. How frequently you would go back to the health facility to get injectable PrEP?	6 monthly 	2 monthly 	
2. How would you like to be assisted should you have questions between appointments?	Return to the facility to see the health care provider 	Through an interactive App (Chatbot) 	
3. The location of this PrEP service	Public Clinic 	Onsite Campus Clinic 	
4. The cost of this service	R100 	 Free	
5. The skills of the provider in the facility	A provider who is not a PrEP specialist 	A provider who is not a PrEP specialist 	
6. The Provider sensitivity	A provider who is NOT a good listener 	A provider who is NOT a good listener 	
7. The waiting time at this facility	30 minutes 	1 hour 	

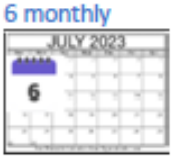
7. Which of these two PrEP services would you choose?

Characteristics of a service	Service A	Service B	Neither
1. How frequently you would go back to the health facility to get injectable PrEP?	6 monthly 	2 monthly 	
2. How would you like to be assisted should you have questions between appointments?	Return to the facility to see the health care provider 	Through an interactive App (Chatbot) 	
3. The location of this PrEP service	Public Clinic 	Onsite Campus Clinic 	
4. The cost of this service	Free 	R150 	
5. The skills of the provider in the facility	A provider who is not a PrEP specialist 	A provider who is not a PrEP specialist 	
6. The Provider sensitivity	A provider who is not a good listener 	A provider who is a good listener 	
7. The waiting time at this facility	1 hour 	30 minutes 	

8. Which of these two PrEP services would you choose?

Characteristics of a service	Service A	Service B	Neither
1. How frequently you would go back to the health facility to get injectable PrEP?	6 monthly 	2 monthly 	
2. How would you like to be assisted should you have questions between appointments?	Return to the facility to see the health care provider 	Through an interactive App (Chatbot) 	
3. The location of this PrEP service	Onsite Campus Clinic 	Public Clinic 	
4. The cost of this service	 Free	R100 	
5. The skills of the provider in the facility	A provider who is not a PrEP specialist 	A provider who specialises in PrEP 	
6. The Provider sensitivity	A provider who is a good listener 	A provider who is not a good listener 	
7. The waiting time at this facility	30 minutes 	1 hour 	

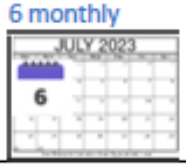
9. **Which of these two PrEP services would you choose?**

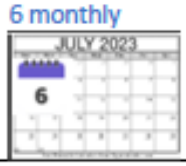
Characteristics of a service	Service A	Service B	Neither
1. How frequently you would go back to the health facility to get injectable PrEP?	6 monthly 	2 monthly 	
2. How would you like to be assisted should you have questions between appointments?	Through an interactive App (Chatbot) 	Through an interactive App (Chatbot) 	
3. The location of this PrEP service	Onsite Campus Clinic 	Public Clinic 	
4. The cost of this service	R100 	R50 	
5. The skills of the provider in the facility	A provider who specialises in PrEP 	A provider who is not a PrEP specialist 	
6. The Provider sensitivity	A provider who is not a good listener 	A provider who is not a good listener 	
7. The waiting time at this facility	1 hour 	1 hour 	

10. Which of these two PrEP services would you choose?

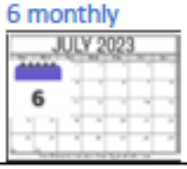
Characteristics of a service	Service A	Service B	Neither
1. How frequently you would go back to the health facility to get injectable PrEP?	2 monthly 	6 monthly 	
2. How would you like to be assisted should you have questions between appointments?	Through an interactive App (Chatbot) 	Return to the facility to see the health care provider 	
3. The location of this PrEP service	Public Clinic 	Onsite Campus Clinic 	
4. The cost of this service	R100 	R50 	
5. The skills of the provider in the facility	A provider who is NOT a PrEP specialist 	A provider who specialises in PrEP 	
6. The Provider sensitivity	A provider who is a good listener 	A provider who is not a good listener 	
7. The waiting time at this facility	30 minutes 	1 hour 	

11. Which of these two PrEP services would you choose?

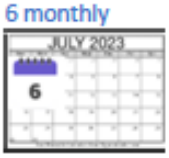
Characteristics of a service	Service A	Service B	Neither
1. How frequently you would go back to the health facility to get injectable PrEP?	2 monthly 	6 monthly 	
2. How would you like to be assisted should you have questions between appointments?	Return to the facility to see the health care provider 	Through an interactive App (Chatbot) 	
3. The location of this PrEP service	Public Clinic 	Onsite Campus Clinic 	
4. The cost of this service	R50 	R150 	
5. The skills of the provider in the facility	A provider who specialises in PrEP 	A provider who is NOT a PrEP specialist 	
6. The Provider sensitivity	A provider who is not a good listener 	A provider who is not a good listener 	
7. The waiting time at this facility	30 minutes 	1 hour 	

Characteristics of a service	Service A	Service B	Neither
1. How frequently you would go back to the health facility to get injectable PrEP?	2 monthly 	6 monthly 	
2. How would you like to be assisted should you have questions between appointments?	Return to the facility to see the health care provider 	Through an interactive App (Chatbot) 	
3. The location of this PrEP service	Onsite campus Clinic 	Public Clinic 	
4. The cost of this service	R100 	R150  	
5. The skills of the provider in the facility	A provider who is not a PrEP specialist 	A provider who specialises in PrEP 	
6. The Provider sensitivity	A provider who is not a good listener 	A provider who is not a good listener 	
7. The waiting time at this facility	30 minutes 	1 hour 	

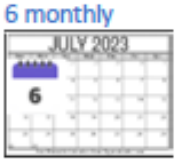
13. Which of these two PrEP services would you choose?

Characteristics of a service	Service A	Service B	Neither
1. How frequently you would go back to the health facility to get injectable PrEP?	6 monthly 	2 monthly 	
2. How would you like to be assisted should you have questions between appointments?	Through an interactive App (Chatbot) 	Through an interactive App (Chatbot) 	
3. The location of this PrEP service	Public Clinic 	Public Clinic 	
4. The cost of this service	R50 	R100 	
5. The skills of the provider in the facility	A provider who is not a PrEP specialist 	A provider who is not a PrEP specialist 	
6. The Provider sensitivity	A provider who is not a good listener 	A provider who is a good listener 	
7. The waiting time at this facility	1 hour 	1 hour 	

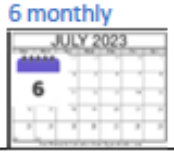
14. Which of these two PrEP services would you choose?

Characteristics of a service	Service A	Service B	Neither
1. How frequently you would go back to the health facility to get injectable PrEP?	2 monthly 	6 monthly 	
2. How would you like to be assisted should you have questions between appointments?	Return to the facility to see the health care provider 	Through an interactive App (Chatbot) 	
3. The location of this PrEP service	Onsite Campus Clinic 	Onsite Campus Clinic 	
4. The cost of this service	R100 	R150 	
5. The skills of the provider in the facility	A provider who specialises in PrEP 	A provider who does not specialise in PrEP 	
6. The Provider sensitivity	A provider who is a good listener 	A provider who is not a good listener 	
7. The waiting time at this facility	1 hour 	30 minutes 	

15. Which of these two PrEP services would you choose?

Characteristics of a service	Service A	Service B	Neither
1. How frequently you would go back to the health facility to get injectable PrEP?	6 monthly 	2 monthly 	
2. How would you like to be assisted should you have questions between appointments?	Through an interactive App (Chatbot) 	Return to the facility to see the health care provider 	
3. The location of this PrEP service	Public Clinic 	Onsite Campus Clinic 	
4. The cost of this service	 Free	R150 	
5. The skills of the provider in the facility	A provider who is not a PrEP specialist 	A provider who is not a PrEP specialist 	
6. The Provider sensitivity	A provider who is a good listener 	A provider who is not a good listener 	
7. The waiting time at this facility	1 hour 	30 minutes 	

16. Which of these two PrEP services would you choose?

Characteristics of a service	Service A	Service B	Neither
1. How frequently you would go back to the health facility to get injectable PrEP?	2 monthly 	6 monthly 	
2. How would you like to be assisted should you have questions between appointments?	Through an interactive App (Chatbot) 	Return to the facility to see the health care provider 	
3. The location of this PrEP service	Public Clinic 	Public Clinic 	
4. The cost of this service	 Free	R150 	
5. The skills of the provider in the facility	A provider who specialises in PrEP 	A provider who specialises in PrEP 	
6. The Provider Sensitivity	A provider who is NOT a good listener 	A provider who is NOT a good listener 	
7. The waiting time at this facility	30 minutes 	1 hour 	

10.15 Appendix O. Discrete Choice Experiment Survey

Confidential

Final DCE

Please complete the survey below.

Thank you!

DEMOGRAPHICS AND DCE TOOL (#DCE-001)

STUDY TITLE: Preferences for service delivery for a long-acting HIV Pre-exposure prophylaxis formulation among students in tertiary institutions in South Africa: A Discrete Choice Experiment

Information Session
Before the session starts, we will briefly provide information about new HIV prevention formulations such as the vaginal ring, long-acting injection, or pill for HIV prevention (10 mins) explaining how these methods work. These methods are HIV pre-exposure (meaning before exposure) and prophylaxis (meaning to prevent); the short name is PrEP.

Name of field worker	◯ Kgana Rathaha ◯ Siphiwe Ndlovu ◯ Tebatso Mofokeng ◯ Patience Shamu ◯ Jessica Visagie
Name of facility	◯ University ◯ TVET
Has the participant provided written consent?	◯ Yes ◯ No (Please check if you have signed the consent form)
Age	_____
1. Do you have a phone?	◯ Yes ◯ No
2. Do you share a mobile phone with anyone?	◯ Yes ◯ No
3. Who do you share your phone with?	◯ Friend ◯ Siblings ◯ Parents ◯ Other _____
4. Do you have access to the Internet?	◯ Yes ◯ No
5. Which year are you currently studying?	◯ First-year ◯ Second-year ◯ Third-year ◯ Fourth-year ◯ Other _____
6. Are you a full-time or part-time student?	◯ Full-time student ◯ Part-time student

	7. Which faculty does your study fall under?	◯ Faculty of Sciences ◯ Faculty of humanities ◯ Faculty of Management Sciences ◯ Faculty of Engineering and the built studies ◯ Faculty of Information and Communication Technology ◯ Other _____
	8. What is your relationship status?	◯ Married ◯ In a stable relationship ◯ Casual partner/s ◯ single - no partner/s
	Please specify other relationships	_____
9	9.Do you currently stay with your mother?	◯ Yes ◯ No
	10. Do you currently stay with your father?	◯ Yes ◯ No
	11. Do you currently stay with relatives?	◯ Yes ◯ No
	12. Do you share your accommodation with anyone?	◯ Yes ◯ No
	13. Do you share accommodation with your siblings?	◯ Yes ◯ No
	14. Do you share accommodation with your partner/spouse?	◯ Yes ◯ No
	15. Do you share accommodation with peers/roommates?	◯ Yes ◯ No
	16. Do you share your accommodation with other relatives?	◯ Yes ◯ No
	Sexual and Reproductive Health	
	17. In the past 3 months, how many sexual partners have you had?	_____
	18. In the past 3 months, did you have sex with sexual partners whose HIV status you did not know?	◯ Yes ◯ No ◯ Unsure
	19. In the past 3 months, did you have unprotected sex where you did not use a condom?	◯ Yes ◯ No ◯ Unsure
	20. Are you having sex with HIV-positive partners?	◯ Yes ◯ No ◯ Unsure

21. In the past 3 months, have you had sex under the influence of alcohol or drugs?	◯ Yes ◯ No ◯ Unsure
22. In the past 3 months, have you had sex or been sexually involved with anyone because he gave you or told you he would give you gifts, cash, or anything else?	◯ Yes ◯ No
23. Have you ever been treated for an STI in the past three months?	◯ Yes ◯ No
24. The last time you had sex, did you or your partner use any method to avoid or prevent pregnancy?	◯ Yes ◯ No
25. If you used hormonal contraception, please specify the method you used	◯ 3-month injection (Depo-Provera ◯ 2-month injection (Nuristerate) ◯ Oral Pill ◯ Implant ◯ IUD ◯ Other _____
26. Have you ever been pregnant?	◯ Yes ◯ No
27. Do you have children of your own?	◯ Yes ◯ No
28. Would you say that using contraception is mainly your decision, mainly your partner's decision, or did you both decide together?	◯ Myself ◯ Partner's decision ◯ Joint decision
29. Who usually makes decisions about health care for yourself: you, your partner, you and your (partner) jointly, or someone else?	◯ Myself ◯ Partner ◯ Jointly [partner and I] ◯ Other _____

Service utilization	
30. Did you visit a healthcare facility in the last three months?	◯ Yes ◯ No
31. Which of the following facilities did you visit?	◯ Campus clinic ◯ Mobile clinic ◯ Pharmacy ◯ Public clinic ◯ Hospital ◯ Private clinic/Dr's private rooms ◯ Other
Please specify the other service you visited?	_____

32. If no service was utilised, explain why?	◯ Did not require services ◯ Temporary clinic closure due to university/college closure ◯ Did not have money for transport. ◯ The clinic closes too early ◯ Clinic is too far ◯ Other _____
33. If yes, what service did you access? [tick all that apply]	☐ Family Planning ☐ PrEP ☐ STI diagnosis, care and treatment ☐ Care for chronic conditions ☐ Other _____

PrEP

34. Of the three PrEP methods I have told you about, which one would you prefer if you were to choose any of them?	◯ Oral PrEP ◯ PrEP ring ◯ CAB-PrEP [injection]
35. Have you ever used PrEP before?	◯ Yes ◯ No ◯ Prefer not to answer
36. Are you currently taking PrEP (before today)	◯ Yes ◯ No

Discrete Choice Experiment (#DCE-002)

Choice task instructions

In this section, I want to try to understand different aspects of service delivery that are important to you. Imagine that the following injectable PrEP services are available and that you have to choose between them. You will see that each option has different advantages and disadvantages. You must indicate which option you would choose by ticking the appropriate option. You can also indicate if you would not choose service A, B or none of the two by choosing the option "neither."

Here is an example of what the choice tasks looks like:

Data Collector:

Please show the participant the printed document DCE Choices and capture the responses in REDCap

Choice set 1 Which of these services would you choose?	◯ Service A ◯ Service B ◯ Neither
If you were to choose between services A and B, which one would you choose?	◯ Service A ◯ Service B

Choice set 2 Which of these choice sets would you choose?	◯ Service A ◯ Service B ◯ Neither
If you were to choose between service A and B which one, would you choose?	◯ Service A ◯ Service B
Choice set 3 Which of these services would you choose?	◯ Service A ◯ Service B ◯ Neither
If you were to choose between service A and B, which one which you choose?	◯ Service A ◯ Service B
Choice set 4 Which of these services would you choose?	◯ Service A ◯ Service B ◯ Neither
If you were to choose between service A and B, which one would you choose?	◯ Service A ◯ Service B
Choice set 5 Which of these services would you choose?	◯ Service A ◯ Service B ◯ Neither
If you were to choose between service A and B, which one would you choose?	◯ Service A ◯ Service B
Choice set 6 Which of these services would you choose?	◯ Service A ◯ Service B ◯ Neither
If you were to choose between service A and B, which one would you choose?	◯ Service A ◯ Service B
Choice set 7 Which of these services would you choose?	◯ Service A ◯ Service B ◯ Neither
If you were to choose between service A and B, which one would you choose?	◯ Service A ◯ Service B
Choice set 8 Which of these services would you choose?	◯ Service A ◯ Service B ◯ Neither
If you were to choose between service A and B, which one would you choose?	◯ Service A ◯ Service B
Choice set 9 Which of the following services would you choose?	◯ Service A ◯ Service B ◯ Neither
If you were to choose between choice set A and B which one would you choose?	◯ Service A ◯ Service B

Choice set 10 Which of these services would you choose?	◯ Service A ◯ Service B ◯ Neither
If you were to choose between services A and B, which one would you choose?	◯ Service A ◯ Service B
Choice set 11 Which of these services would you choose?	◯ Service A ◯ Service B ◯ Neither
If you were to choose between service A and B, which one would you choose?	◯ Service A ◯ Service B
Choice set 12 Which of these services would you choose?	◯ Service A ◯ Service B ◯ Neither
If you were to choose between services A and B, which one would you choose?	◯ Service A ◯ Service B
Choice set 13 Which of these services would you choose?	◯ Service A ◯ Service B ◯ Neither
If you were to choose between service A and B, which one would you choose?	◯ Service A ◯ Service B
Choice set 14 Which of these services would you choose?	◯ Service A ◯ Service B ◯ Neither
If you were to choose between service A and B, which one would you choose?	◯ Service A ◯ Service B
Choice set 15 Which of these services would you choose?	◯ Service A ◯ Service B ◯ Neither
If you were to choose between service A and B, which one would you choose?	◯ Service A ◯ Service B
Choice set 16 Which of these services would you choose?	◯ Service A ◯ Service B ◯ Neither
If you were to choose between service A and B, which one would you choose?	◯ Service A ◯ Service B

THANK YOU FOR PARTICIPATING IN THE SURVEY

10.16 Appendix P. Permission to Conduct Research (i)

GAUTENG PROVINCE
HEALTH
REPUBLIC OF SOUTH AFRICA

Enquiries: Dr. Manei Letebele-Hartell
Tel: +27 12 451 9036
E-mail: Troy.Mashabela@gauteng.gov.za

TSHWANE RESEARCH COMMITTEE: CLEARANCE CERTIFICATE

DATE ISSUED: 15/02/2022
PROJECT NUMBER: 10/2022
NHRD REFERENCE NUMBER: GP_202201_035

TOPIC: Preferences for service delivery for long-acting Pre-Exposure Prophylaxis formulations among students in tertiary Institutions in South Africa: A Discrete Choice Experiment

Name of the Lead Researcher:	Mrs Patience Shamu Prof Saiqa Mullick
Facilities:	Maria Rantho Clinic
Name of the Department:	Wits Reproductive Health and HIV Institute

NB: THIS OFFICE REQUEST A FULL REPORT ON THE OUTCOME OF THE RESEARCH DONE AND

NOTE THAT RESUBMISSION OF THE PROTOCOL BY RESEARCHER(S) IS REQUIRED IF THERE IS DEPARTURE FROM THE PROTOCOL PROCEDURES AS APPROVED BY THE COMMITTEE.

DECISION OF THE COMMITTEE: **APPROVED**

.....
Dr. Manei Letebele-Hartell
Chairperson: Tshwane Research Committee

Date: 15/02/2022

.....
Mr. Mothomone Pitsi
Chief Director: Tshwane District Health

Date: 2022.02.17

10.17 Appendix Q. Permission to Conduct Research (ii)

Tshwane University of Technology
We empower people

Research Ethics Committee

The TUT Research Ethics Committee is a registered Institutional Review Board (IRB 00005968) with the US Office for Human Research Protections (IORG# 0004997) (Expires 14 Jan 2023). Also, it has Federal Wide Assurance for the Protection of Human Subjects for International Institutions (FWA 00011501). In South Africa it is registered with the National Health Research Ethics Council (REC-160509-21).

June 10, 2022

REC Ref #: REC/2022/02/006
Name: Shamu P
Student #: Wits

Ms P Shamu
C/o
Wits Reproductive Health and HIV Research Institute (WRHI)
University of the Witwatersrand

Dear Ms Shamu,

Decision: Gatekeeper Permission: Final Approval

Name: Shamu P
Project title: *Preferences for service delivery for long-acting HIV Pre-Exposure Prophylaxis formulations among students in tertiary institutions in South Africa: A Discrete Choice Experiment.*
Qualification: PhD
Supervisor:

Thank you for submitting the revised project documents for review by the Research Ethics Committee (REC), Tshwane University of Technology (TUT). In reviewing the documents, the comments and notes below are tabled for your consideration, attention and/or notification:

- **Proposal**
  - The revised proposal is in order.

- **Information Leaflet and Informed consent**

- The revised Information Leaflet is in order.

The Tshwane University of Technology Research Ethics Committee reviewed the revised project documents at its meeting on April 25, 2022. **Gatekeeper permission** has been granted to the project.

The proposed research project may now continue with the proviso that:

1) The researcher/s will conduct the study according to the procedures and methods indicated in the **approved proposal**, particularly in terms of any undertakings and/or assurances made regarding the confidentiality of the collected data.
2) The proposal will be submitted to the Committee for prospective ethical clearance if there are any substantial **deviations** and/or changes from the approved proposal.
3) The researcher/s will act within the parameters of any applicable **national legislation, professional codes of conduct**, institutional guidelines and scientific standards relevant to the specific field of study. Strict adherence to the following South African legislation, where applicable, is especially important: Protection of Personal Information Act (Act 4 of 2013), Children's Act (Act 38 of 2005) and the National Health Act (Act 61 of 2003).
4) The researcher will inform the REC as soon as possible of any **adverse events** involving research participants that may have occurred during the course of the study. It includes the actions and/or processes that were implemented to mitigate and/or prevent any further injuries and/or adverse outcomes.
5) The researcher will inform the REC of any **new or unexpected ethical issues** that may have emerged during the course of the study, as well as how these ethical issues were addressed. The researcher must consult with the REC for advice and/or guidance in any such event.
6) The current ethics approval expiry date for this project is **June 9, 2024**. No research activities may continue after the ethics approval expiry date. An application for the extension of ethics approval must be submitted for projects that need to continue beyond the expiry date.

Note:
The reference number [top right corner of this communiqué] should be clearly indicated on all forms of communication [e.g. Webmail, E-mail messages, letters] with the intended research participants.

Yours sincerely,

Prof TS Ramukumba
Chairperson: Research Ethics Committee
[TUTRef#2022-02-006-ShamuP]

10.18 Appendix R. Permission to Conduct Research (iii)

higher education & training
Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

TSHWANE NORTH TVET COLLEGE

Wits RHI

8 Blackwood Avenue

Park Town

Johannesburg

2193

Dear Ms P Shamu

RE: PERMISSION TO CONDUCT RESEARCH AT TSHWANE NORTH TVET COLLEGE

Permission is hereby granted to conduct research at Tshwane North TVET College, regarding the research topic **(Preferences for service delivery for long-acting HIV Pre-exposure prophylaxis formulations among students in tertiary institutions in South Africa: A Discrete Choice Experiment)** as part of your Doctoral degree (PhD) at the University of the Witwatersrand, (Wits).

Upon receipt of this permission, you may approach any site of TNC (and make necessary arrangements to continue with your studies.)

It will be appreciated if you would share the findings of your studies with the Institution.

We wish you success with your research study.

Regards

Ms Tsibogo

Principal

Date: 20/06/2022.

Central Office
Cnr. Kgosi Mampuru (former Potgieter Street) & Pretorius Streets
Tel: (012) 401 1727/1961
Fax: (012) 323 5683

10.19 Appendix S. Plagiarism Declaration

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG

FACULTY OF HEALTH SCIENCES

PLAGIARISM DECLARATION TO BE SIGNED BY ALL HIGHER DEGREE STUDENTS

SENATE PLAGIARISM POLICY: APPENDIX ONE

I Patience Shamu (Student number: 1561506) am a student registered for the degree of Doctor of Philosophy in the academic year 2025.

I hereby declare the following:

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

Signature: pshamu Date: 23 January 2025

1

10.20 Appendix T. Turnitin Report

23-03-25

P_Shamu_Thesis_21_03_2025_Turn_it_in version_v1-1.docx

ORIGINALITY REPORT

7%	5%	5%	%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	www.science.gov Internet Source	1%
2	Seston, Elizabeth M.. "Eliciting women's preferences for the supply of emergency hormonal contraception using qualitative and quantitative research techniques.", The University of Manchester (United Kingdom), 2018 Publication	<1%
3	hdl.handle.net Internet Source	<1%
4	"Abstracts of the HIV Research for Prevention Meeting, HIVR4P, 21-25 October, 2018, Madrid", AIDS Research and Human Retroviruses, 2018 Publication	<1%
5	www.frontiersin.org Internet Source	<1%
6	discovery.researcher.life Internet Source	<1%
7	Mabena, Christina Linky Manthipa. "Communication Guidelines to Support Grandparent Headed Families Regarding	<1%

10.21 Appendix U. Distress Protocol

DISTRESS PROTOCOL AND SOCIAL HARM FORM

Wits Reproductive Health and HIV Institute

Dear Data Collector/Fieldworker,

Thank you for participating in this research entitled *'Preferences for service delivery for long-acting HIV Pre-exposure prophylaxis formulations among students in tertiary institutions in South Africa: A Discrete Choice Experiment.'* Here is information on how we expect you to assist if a participant reports any case of violence/abuse or indicates that they are experiencing a high level of stress or emotional distress during the data collection process as well as the form required to be completed for documenting this distress.

Please ensure you use the referral forms given to you and complete them **in full.**
Kindly follow the 3 steps below in any case of emotional distress, disclosure, abuse or violence:

Stage 1

If it happens during the data collection/study activities, please stop the discussion/ interview/ activities. Assess the state of the participant by asking if they would like to step out for a moment? It is important to document whatever the participant tells you. Be careful NOT to ask leading questions. Resume the interview/discussion/activity if participant feels able to carry on.

Stage 2

If the participant is unable to continue, please ask them to sit and get some fresh air. Guide them to a member of the study team who can support them further, in a quiet space, where you can talk. As you discuss with the participant and hear their story, make a note of the issues they are mentioning and note these on the social harm from. This will be needed for the counsellor to follow up. Explain to them that help is freely available, and they are not alone.

Your reaction to their disclosure is very important. The following messages should be repeated consistently throughout the conversations where any form of abuse is disclosed:

- I BELIEVE you
- I am glad you told me. (Affirm the participant's courage for disclosing to you)
- I am sorry it happened to you.
- It is NOT your fault. (Listen. Display empathy, warmth and acceptance)
- I need to speak to other experts in order to keep you safe and to make sure it does not happen again. (Clarify confidentiality, but make sure to tell the participant that other experts will need to be involved)

Stage 3

If the participant consents, the counsellor may make a follow-up with a courtesy call.

SOCIAL HARM (SH) REPORT FORM

Instructions: This form is to be completed by the study team for any participant who reports a social harm/abuse. The form must be completed in full and should be based on reports from the participant. Afterward the form(s) will be emailed to Patience Shamu, the Principal Investigator, pshamu@wrhi.ac.za

Date Form Completed:	
Participant Identifying Details	
Contact Number	
Alternative Number	
Name of Site	
Age	
Home Address	
Social harm	
Describe the social harm	
Date of disclosure	(dd/mm/yyyy)
Date of social harm (if multiple, note in comments)	(dd/mm/yyyy)
Describe type of social harm experienced (mark all that apply)	- Physical abuse - Emotional abuse - Financial abuse - Sexual abuse - Substance and drug abuse - Other, specify: _____
Any other relevant information	
Based on your discussion with the participant, do you think this situation is resolved?	- Yes - No - Other (specify)_____
What action, recommendation or suggestion was provided to participant to help resolve issue?	
Referrals made *(mark all that apply)*	- Post Violence Support (SAPS, FAMSA etc.) - No referrals needed - Other, specify: _____

You may refer the affected person to the following counsellor who will provide counselling services free of charge or alternatively refer them to the nearest available counsellor within their area who can also offer counselling services free of charge.

Name of Counsellor: Kerry Gordon
Contact number: 0113585573

10.22 Appendix V. Non-Disclosure Agreement

NON-DISCLOSURE AND CONFIDENTIALITY AGREEMENT

Preferences for service delivery for long-acting HIV Pre-exposure prophylaxis formulations among students in tertiary institutes in South Africa: A Discrete Choice Experiment

As a member of this study's data collection team, I, the undersigned, understand that I have access to confidential and personal information about study sites and participants. By signing this agreement, I acknowledge that the data collected is the property of *Wits Reproductive Health and HIV Institute of the University of the Witwatersrand, Johannesburg*. I am indicating my understanding and agreement of my responsibilities to maintain confidentiality and not disclose any information and / or data about this study to any unauthorized person/s or third persons and agree to the following:

- I understand that names and any other identifying and personal information about study sites and participants are completely confidential.
- I agree not to divulge, publish, or otherwise make known to unauthorized persons or third persons or to the public any information obtained in the course and scope of this research project that could identify the person/s who participated in the study.
- I understand that all information and / or data about study sites or participants obtained or accessed by me in the course and scope of my work is private and confidential. I agree not to divulge or otherwise make known to unauthorized persons any of this information and / or data, unless specifically authorized to do so by approved protocol or by the local principal investigator acting in response to applicable law or court order, or public health or clinical need.
- I understand that I am not to read information about study sites or participants, or any other confidential and private documents, nor ask questions of study participants for my own personal information but only to the extent, for the purpose in the course and scope of performing my assigned duties and responsibilities on this research project.
- I agree to notify, within a reasonable time, the local principal investigator immediately should I become aware of any and all breach/s of confidentiality or a situation which could potentially result in a breach, whether this be on my part or on the part of another person.
- I agree to fully comply with the statutory obligations contained in the Protection of Personal Information Act No. 4 of 2013 ("POPIA") and the regulations issued in terms thereof and will process all Personal information and/or personal data in respect of this agreement in accordance with POPIA and only for the purpose of fulfilling my obligations in terms of this agreement.

Signature	Date	Printed name

University of the Witwatersrand
WITS RHI

Tel +27 11 358 5300 | Hillbrow Health Precinct, 22 Esselen Street, Hillbrow, 2001, Johannesburg, South Africa | www.wrhi.ac.za

Wits RHI is an Institute of the University of the Witwatersrand and a WHO Collaborating Centre

10.23 Appendix W. DCE Participant Information Sheet

PARTICIPANT INFORMATION SHEET – DISCRETE CHOICE EXPERIMENT SURVEY

STUDY TITLE

Preferences for service delivery for long-acting HIV Pre-Exposure Prophylaxis formulations among students in tertiary institutions in South Africa: A Discrete Choice Experiment

Good day

My name is Patience Shamu. I'm a PhD student at Wits Reproductive Health and HIV Research Institute (WRHI) of the University of the Witwatersrand, Johannesburg.

Invitation paragraph

We would like to invite you to consider participating in a survey to understand how young women prefer to receive services for delivering new long-acting HIV prevention methods which use HIV pre-Exposure Prophylaxis (PrEP).

Before you decide whether or not to take part, it is important for you to understand why the research is being done and what it will involve. Please take time to read this information sheet carefully as it will help you to decide if you would like to participate.

What is the purpose of the study?

HIV remains high in South Africa, especially amongst young people despite the existence of different HIV prevention methods such as condoms. Some of the existing methods such as condoms however do not give women control over HIV prevention. New HIV prevention methods such as the ring, monthly pill or injection every 2 or 6 months are currently under investigation. Although these new methods are being developed, how these products are delivered to the users is very important in ensuring the success of the different methods.

During an earlier phase of the study, most students said that they preferred to use injectable PrEP over other methods. We therefore seek to understand more about how individuals prefer the long-acting injectable PrEP formulations to be delivered to them. We are particularly interested in knowing where they prefer to get the HIV prevention products from, how they prefer to receive information about the methods, that is face to face, or through a phone application and other characteristics of service delivery which they might value.

Why have I been invited to participate?

You have been invited to participate because you are studying at a university or technical and vocational training (TVET) college which is in Tshwane sub-district 1 and accessing sexual and

reproductive health services either through Maria Rantho mobile health facility or through your campus clinic.

Do I have to take part?

Your participation in this study is entirely voluntary and you may refuse to participate or withdraw from the study at any time without having to explain. You have the right to make an informed decision whether or not to participate. Even if you decide to take part in the study, you may refuse to answer any questions you feel uncomfortable responding to.

You will not suffer any adverse consequences in the event of you refusing to take part in the study, withdrawing from the study or not answering all questions. Equally, choosing to take part in the study will not entitle you to any benefits.

What will happen to me if I take part?

If you decide to take part in the study, after signing the consent form, a trained interviewer will conduct a short (10 minute) information session with you regarding the survey and how it works. The survey has two parts. During the first part of the survey, the interviewer will ask you questions about yourself, such as but not limited to your age and use of health services. The interviewer will read out options for you to select from a computer tablet. The interviewer will capture this information on a computer tablet. The interviewer will then move to the second part where you will be asked to select one option from the choices provided. This survey will take 30-40 minutes of your time.

What are the possible disadvantages and risks of taking part? (where appropriate)

There are no direct risks associated with participating in this study. However, your participation in this study may become known to others. We will make every effort to protect your privacy. You will not be named in any publication arising from this work.

What are the possible benefits of taking part?

The study does not involve any direct benefits to you. The benefits hoped for from this study, through your participation, is for researchers to better understand what students from tertiary institutions prefer regarding the delivery of long-acting PrEP services to inform delivery in South Africa.

Reimbursement

You will not incur any financial costs by participating in this study. You will however be reimbursed with a voucher worth R50 for the time inconvenience resulting from participating in this study.

Will my information in this study be kept confidential?

All the information collected will be kept as privately as possible. You will not be asked to write your name on the survey, and you will be identified through a unique code which is computer generated. All the data will be kept on a secure computer using a study number not your name. Your identifiable information (such as your name) will be kept separately. In this way the data are locked so that researchers cannot link the information they are analyzing to named individuals. We take necessary measures to protect the identities of participants.

What should I do if I want to take part?

If you decide to take part in the study, you will be given this information sheet by a study interviewer. You can either have the study interviewer read the information sheet to you or you can read it yourself. You will be given this information sheet to keep and will then be asked to provide your name, date and signature on a consent form.

What will happen to the results of the research study?

Once the study has been completed, the information obtained from all participants will be put together and academic papers will be written and published in journal articles and some of the information will be presented at seminars or conferences. A PhD thesis will be written with the collected information. We will gladly provide you with a summary of the results on request. The information used for this publication cannot be traced back to you. All data collected during the course of the study will be securely retained for two (2) years, if a scientific publication arises from the study and six (6) years if there is no publication. Thereafter it will be destroyed accordingly.

Who is funding the research?

This PhD is funded by the Consortium for Advanced Research Training in Africa (CARTA).

Who has approved this study?

This study has been approved by the Human Research Ethics Committee (Medical) of the University of the Witwatersrand, Johannesburg ("Committee"). A principal function of this Committee is to safeguard the rights and dignity of all human subjects who agree to participate in a research project and the integrity of the research.

If you have any concern over the way the study is being conducted, please contact the Chairperson of this Committee who is Professor Clement Penny, who may be contacted on telephone number 011 717 2301, or by e-mail on Clement.Penny@wits.ac.za. The telephone numbers for the
Committee secretariat are 011 717 2700/1234 and the e-mail addresses are Zanele.Ndlovu@wits.ac.za and Rhulani.Mukansi@wits.ac.za

Contact for Further Information

In the event of any problems, concerns or questions you may contact the Chair/s of the Ethics Committee that has reviewed the study or the study team using the following details:

Patience Shamu [PhD Candidate]
University of the Witwatersrand
Wits Reproductive Health and HIV Institute
8 Blackwood Avenue, Parktown, Johannesburg, South Africa
Tel: 011 358 5677
Email: pshamu@wrhi.ac.za/1561506@students.wits.ac.za

Prof Saiqa Mullick [Supervisor]
University of the Witwatersrand
Wits Reproductive Health and HIV Institute
Director, Implementation Science
8 Blackwood Avenue, Parktown, Johannesburg, South Africa
Tel: 011 358 5677
Email: smullick@wrhi.ac.za

THANK YOU FOR READING THIS STUDY INFORMATION SHEET

10.24 Appendix X. DCE Informed Consent Form

PARTICIPANT CONSENT SHEET- DISCRETE CHOICE EXPERIMENT SURVEY

STUDY TITLE
Preferences for service delivery for long-acting HIV Pre-Exposure Prophylaxis formulations among students in tertiary institutions in South Africa: A Discrete Choice Experiment

---

I _____
(participant name)

have been informed about the study entitled: Preferences for service delivery for long-acting HIV Pre-Exposure Prophylaxis formulations among students in tertiary institutions in South Africa: A Discrete Choice Experiment

_____ (name of researcher/fieldworker).

I have been given a Participant Information Sheet which explains the nature and processes involved in this study, which is attached hereto;

I was given time to read it, or had it read to me;

I was given time to ask any questions I wanted to and found any answers given to me to be reasonable and satisfactory;

I believe I fully understand why the study is being conducted and what the intended outcomes will be;

I understand the purpose and procedures of the study as per the Participant Information Sheet and agree to take part in this study;

I have been given an opportunity to ask questions about the study and have had answers to my satisfaction

I declare that my participation in this study is entirely voluntary and that I may withdraw at any time without affecting my care at this facility or any other facility

I consent to the processing of my personal information and data for the purposes of this research study. I understand that such information will be treated as strictly confidential and handled in accordance with the
Protection of Personal Information Act (2013)

I also understand that I am not giving up any of my legal rights by signing this informed consent document

If I have any further questions/concerns or queries related to the study I understand that I may contact Patience Shamu, telephone 011 358 5300
Prof Saiqa Mullick (supervisor), Tel.: 011 358 5600, email: smullick@wrhi.ac.za
Prof Nicola Christofides (supervisor), Tel: 0117172566, email: Nicola.Christofides@wits.ac.za

If you have any concern over the way the study is being conducted, please contact the Chairperson of the Ethics Committee of The University of the Witwatersrand, Johannesburg, who is Prof Paul Ruff., who may be contacted on telephone number 011 717 2301, or by e-mail on Paul.Ruff@wits.ac.za. The telephone numbers for the Committee secretariat are 011 717 2700/1234 and the e-mail addresses are Zanele.Ndlovu@wits.ac.za and Rhulani.Mukansi@wits.ac.za

I hereby provide my written consent:

_____	_____	_____
Name of Participant	Signature of Participant	Date
_____	_____	_____
Name of Data Collector	Signature of Data Collector	Date
_____	_____	_____
Name of Witness	Signature of Witness	Date

Investigator or person who conducted Informed Consent discussion:

I confirm that I have personally explained the nature and extent of the planned research, study procedures, potential risks and benefits, and confidentiality of personal information.

Name of person obtaining consent: _____

Signature of person obtaining consent: _____

Date: _____

10.25 Appendix Y. Student's and co-authors agreement

Declaration: Student's contribution to article(s) and agreement of co-author(s)

I, Patience Shamu declare that this Thesis is my own work and that I contributed adequately towards research findings published in the article(s) stated below which are included in my Thesis/Dissertation/Research Report.

Signature of Student: Shamu **Date:** 26/03/2025

Name of Primary Supervisor: Prof Saiqa Mullick

Signature of Primary Supervisor:

Date: 26 March 2026

Agreement by co-authors: By signing this declaration, the co-authors listed below agree to the use of the article(s) by the student as part of her Thesis. In cases where the student is not the 1st author of a published article, the primary supervisor must explain (under comments) why the student is entitled to use the paper for his/her degree purposes.

Article 1: Title: Facilitators and Barriers to contraceptive uptake and use: perspectives of female students in South Africa and lessons for quality provision pre-exposure prophylaxis to prevent HIV.

Journal name, year, volume and page numbers: Under review at PLOS One

Authors	Name	Signature	Date
1st author	Patience Shamu	Shamu	26/03/2025
2nd author	Nicola J. Christofides		26/03/2025
3rd author	Saiqa Mullick		26/03/2025
4th author			
5th author			
6th author			

Comments by primary supervisor: All in order.

Article 2: Title: Perceptions of the attributes of new long-acting HIV Pre-Exposure Prophylaxis formulations compared with a daily, oral dose among South African young women: A qualitative study.

Journal name, year, volume and page numbers: AIDS Care, 36:12, 1815-1825

Authors	Name	Signature	Date
1st author	Patience Shamu	Shamu	26/03/2025
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Comments by primary supervisor: All in order.

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