OPEN ACCESS

Orapuh Journal

ORIGINAL ARTICLE

Journal of Oral & Public Health

Barriers to implementation of HIV pre-exposure prophylaxis (PrEP) guidelines in Gauteng, South Africa: A qualitative study of nurses' perspectives

Ntimani, J. M., Mokoena-de Beer, A. G., & Phetlhu, D. R.

Nursing Science Department, School of Health Care Sciences, Sefako Makgatho Health Sciences University, Pretoria, South Africa

ARTICLE INFO

Received: *18 July 2025*
Accepted: *28 August 2025*
Published: *13 December 2025*

Keywords:
HIV, guidelines, healthcare delivery, implementation barriers, nurses, pre-exposure prophylaxis, South Africa

Peer-Review: *Externally peer-reviewed*

Correspondence to:
Dr Andile Glodin Mokoena-de Beer,
andile.mokoena@smu.ac.za

To cite:
Ntimani, J. M., Mokoena-de Beer, A. G., & Phetlhu, D. R. (2025). Barriers to implementation of HIV pre-exposure prophylaxis (PrEP) guidelines in Gauteng, South Africa: A qualitative study of nurses' perspectives. *Orapuh Journal, 6*(12), e1315 https://dx.doi.org/10.4314/orapj.v6i12.115

ISSN: *2644-3740*

Published by Orapuh, Inc. (info@orapuh.org)

Editor-in-Chief: Prof. V. E. Adamu
Orapuh, Inc., UMTG PMB 405, Serrekunda, The Gambia, editor@orapuh.org.

ABSTRACT

Introduction

South Africa has one of the largest HIV burdens globally making Pre-Exposure-Prophylaxis (PrEP) a critical prevention intervention. Although national recommendations for PrEP were issued in 2016, barriers to implementation persist, particularly within the public healthcare setting.

Purpose

This study aimed to investigate the systemic barriers experienced by nurses in public clinics when implementing PrEP guidelines within Johannesburg, Gauteng Province.

Methods

A qualitative exploratory design using purposive sampling was employed. The researcher recruited 34 registered nurses who are actively involved in providing PrEP services from four municipal clinics in Johannesburg Sub-districts A and E. However, 19 nurses participated in the study. Data were collected through in-depth, semi-structured interviews and analysed using thematic analysis to identify key patterns and insights.

Results

The analysis revealed four primary barriers to the implementation of PrEP guidelines. Firstly, workforce preparation emerged as a major challenge, particularly the lack of prerequisite PrEP-specific training and the associated fears among nurses who perceived the services as "unfamiliar." Secondly, resource constraints were evident, characterised by frequent stockouts of PrEP drugs and shortages of essential supplies necessary for effective service delivery. Thirdly, infrastructure limitations, especially the absence of private consultation spaces, compromised client confidentiality and hindered the quality of care. Lastly, challenges in information management were observed, including poor filing systems and incomplete electronic records, which made it difficult to track clients and ensure appropriate follow-up. Collectively, these barriers significantly impeded the effective rollout of PrEP services within the study setting.

Conclusion

Policy-level interventions targeting nurse training, supply chain management, clinic infrastructure, and health information systems—alongside ensuring an enabling policy environment—are essential for effective PrEP rollout in South Africa. Strengthening these domains will enhance sustainable PrEP delivery, safeguard patient privacy, and contribute to optimal HIV prevention. Resource allocation should align with South Africa's National Strategic Plan (2023–2028) to facilitate the integration of PrEP services into routine primary healthcare.

INTRODUCTION

Over the past four decades, South Africa has been particularly impacted by one of the most severe HIV epidemics in the world. The earliest cases were documented among the LGBT community, patients with haemophilia, and individuals receiving blood transfusions (Karim et al., 2009). The infection rate rose sharply, reaching 22.4% by 2000, and the number of HIV-positive people increased from 3.8 million in 2002 to 8.2 million in 2021. Recognising the critical need for prevention, South Africa implemented PrEP guidelines in 2016, following World Health Organization (WHO) recommendations. This marked a watershed moment in the country's HIV prevention policy, initially targeting high-risk populations, including female sex workers (FSWs) and men who have sex with men (MSM) (Department of Health [DoH], 2021). By 2017, the National Department of Health expanded the PrEP programme to all individuals at risk of acquiring HIV, together with behavioural modification strategies such as condom use and male medical circumcision.

Since the adoption of PrEP guidelines, South Africa has made significant progress in increasing and promoting HIV prophylaxis, becoming one of the leading countries globally in PrEP initiation. With more than 1.2 million initiations, South Africa remains at the forefront of global efforts to reduce HIV transmission through biomedical prevention methods. International funding has been critical in advancing PrEP rollout, particularly through USAID-funded initiatives such as the President's Emergency Plan for AIDS Relief (PEPFAR) (Milimu et al., 2024). However, the country's success is also due to consistent domestic leadership, with the Department of Health playing a pivotal role in supporting long-term expansion and integration of PrEP into national health systems.

One of the most significant challenges in scaling up PrEP has been maintaining efficient health information systems and supply chain management. South Africa has demonstrated adaptability by establishing interim reporting systems that bridge data-collection gaps and improve monitoring of PrEP distribution and uptake. These adaptive strategies have strengthened the healthcare system and facilitated wider diffusion of PrEP services. Recognising the importance of accessible and person-centred care, the government has adopted both community-based and facility-based delivery approaches. Nurses and lay health workers have played a key role in providing customised, stigma-free services that support clients to initiate and adhere to PrEP. South Africa has also diversified service delivery models, including mobile clinics and virtual platforms, to improve accessibility, particularly for vulnerable populations facing barriers in traditional healthcare settings.

Implementation science has further supported the adoption of innovative HIV prevention approaches by expanding PrEP options beyond oral formulations. South Africa has incorporated novel biomedical technologies such as the dapivirine vaginal ring (DVR) and long-acting injectable cabotegravir (CAB-LA), providing individuals with alternatives tailored to their preferences and needs (Milford et al., 2024). These developments represent a major step forward in the HIV response, addressing long-standing challenges related to daily adherence and accessibility. South Africa's commitment to expanding PrEP access and choice—supported by global investment and national leadership—demonstrates the country's determination to reduce and eventually eliminate HIV transmission. As new biomedical prevention tools continue to emerge, ensuring equitable access, adequate education, and sustained funding will be critical to achieving an HIV-free future.

Although PrEP has reduced HIV incidence in South Africa, implementation remains challenging at the individual, community, and institutional levels (Bavinton et al., 2021). Despite increased awareness and availability, structural barriers continue to impede widespread adoption. Low initiation rates are partly linked to insufficient knowledge among individuals at high risk of HIV infection. Addressing this gap requires targeted public health campaigns and context-appropriate information. Nurses without extensive PrEP training often struggle to counsel and support patients effectively. While national regulations, guidelines, and funding mechanisms exist, implementation varies across facilities. Nurses in public healthcare settings frequently encounter stockouts of PrEP medication, shortages of essential equipment, and limited opportunities for ongoing professional development (Nesengani et al., 2025). Stigma and discrimination from healthcare providers, communities, and family members

also discourage potential PrEP users from enrolling in the programme.

Given the limited research focused on nurses' experiences with PrEP guideline implementation in Gauteng, this study seeks to address that gap by exploring the systemic barriers encountered in municipal clinics. The aim is to generate evidence that can inform policy and practice improvements to facilitate broader and more effective PrEP uptake in high-burden settings.

METHODS

Research Design

This study utilised a qualitative exploratory design informed by the Donabedian Model (Donabedian, 1980), which assesses healthcare quality through three interconnected components: structure (e.g., staffing and resources), process (e.g., service delivery and provider interactions), and outcomes (e.g., service accessibility and patient experiences). The study examined the systemic barriers faced by nurses when implementing PrEP guidelines. This design allowed the researcher to engage with nurses and collect comprehensive data on the obstacles influencing PrEP acceptability within healthcare settings (Polit & Beck, 2021).

Setting of the Study

The study was conducted in municipal clinics located in Johannesburg, focusing on Sub-districts A and E, which together include sixteen clinics—eight in each sub-district. Four clinics were purposefully selected as data collection sites due to their high volumes of HIV patients and active provision of PrEP services. A total of 34 registered nurses were invited to participate, with 19 ultimately taking part in the interviews. Participant allocation was as follows: Clinic 1 (5 nurses), Clinic 2 (5 nurses), Clinic 3 (5 nurses), and Clinic 4 (4 nurses). This selection provided varied representation of nursing experiences within high-demand PrEP service settings.

Study Population

The study population comprised registered nurses working across the four designated clinics. All nurses had undergone training in Nurse-Initiated Management of ART (NIMART) and PrEP guidelines and had been providing PrEP services for at least six months.

Sample and Sampling Technique

A purposive sampling technique was used to select registered nurses with a minimum of six months' experience working in an ART/PrEP stream. This technique ensured that participants possessed adequate knowledge and experience relevant to the study aim, facilitating comprehensive and meaningful data collection (Brink et al., 2020). Strategic sampling also enabled the inclusion of nurses from clinics with high HIV prevalence, capturing a broad range of contextual challenges associated with PrEP implementation.

Initially, 34 registered nurses were recruited from the four clinics. Data saturation was achieved after interviews with 18 participants and confirmed with the 19th, at which point no new themes or concepts emerged. The final sample size aligns with established standards for qualitative studies aimed at achieving thematic saturation (Braun & Clarke, 2021).

The study inclusion criteria were as follows:

- Nurses must have completed at least six months of employment at an ART/PrEP site to ensure adequate exposure to routine PrEP service delivery.
- Participants must be registered nurses trained in NIMART and PrEP to confirm the requisite clinical knowledge and technical skills.

Participant Recruitment

Participants were recruited voluntarily with the support of the facilities' operational managers, ensuring that no form of coercion influenced the selection process. Before enrolment, participants were provided with detailed information on the study's purpose, procedures, and their rights—including the right to withdraw from the study at any time without penalty. Written informed consent was obtained from all participants, and ethical standards were maintained throughout the study. The recruitment process upheld the study's integrity and contributed to the trustworthiness of the findings.

Data Collection Procedure

Research Instrument

Before formal data collection, the researcher conducted a pre-test of the data collection instrument to assess feasibility

and ensure the tool appropriately captured relevant information. The instrument was piloted with three registered nurses from two different sites. The interview guide included three central questions addressing the challenges and needs of nurses during PrEP guideline implementation, based on the Donabedian framework (structure, process, and outcomes). As the pre-test demonstrated that the tool effectively met the study objectives, the data obtained were incorporated into the main dataset.

Data Collection Procedures

Data were collected from March to May 2024. Semi-structured, face-to-face interviews were conducted in private offices within the clinics according to a pre-arranged schedule. Each interview lasted an average of 38 minutes, ranging from 30 to 45 minutes. Participants responded to three primary questions exploring the barriers they experience when implementing PrEP guidelines. One of the main questions was:

"What barriers are you facing while implementing PrEP guidelines in your facility?"

Probing questions were used to elicit richer responses, including:

"What resources and support are available to assist you in implementing PrEP guidelines?"

"What challenges do you experience during PrEP guideline implementation?"

Interviews were conducted in English. Field notes were recorded descriptively, and, with participants' consent, interviews were audio-recorded to ensure accuracy. Data collection concluded upon reaching saturation, which occurred with the 18th interview and was confirmed by the 19th. Data saturation was evaluated through repetition of themes, consistency of participant responses, and adequacy of information depth.

Data Analysis

Thematic analysis was used to systematically identify, organise, and interpret themes representing key insights across the dataset (Braun & Clarke, 2021). Tesch's approach guided the analysis, beginning with familiarisation through repeated reading of transcripts, field notes, and audio recordings. Initial coding involved manually highlighting significant statements, concepts, and recurring ideas. Codes were then refined, grouped, and categorised into sub-themes and overarching themes aligned with the study objectives.

An independent coder reviewed all themes and sub-themes to enhance reliability and rigour. A consensus meeting between the researcher and the independent coder ensured agreement on theme structure and interpretation. All transcripts, field notes, and audio recordings were stored in a password-protected file to maintain confidentiality and ethical standards.

Ethical Considerations

Ethical approval was obtained from the Sefako Makgatho Health Sciences University Research Ethics Committee (SMUREC/H/485/2023: PG). Permission to conduct the study was granted by the Johannesburg Health District Research Committee (NHRD REF. NO.: GP_202402_012), as well as by primary healthcare managers and facility managers at participating clinics.

Participants received full information regarding the study's objectives and procedures. Written informed consent was obtained, and participants were reminded of their right to withdraw at any stage without consequences. Confidentiality was upheld by ensuring that no identifying information was linked to participant responses. Audio recordings, field notes, and transcripts were securely stored in a password-protected digital folder. Participation was entirely voluntary, with no evidence of coercion.

Trustworthiness

Trustworthiness in qualitative research ensures that findings are credible, dependable, and meaningful (Patton, 2015). This study applied five criteria—credibility, transferability, dependability, confirmability, and authenticity—to ensure the accuracy and reliability of the findings (Polit & Beck, 2021).

Credibility was enhanced through triangulation and member checking, whereby participants reviewed and validated their responses. Transferability was supported by providing detailed descriptions of the study methodology, context, participant selection, and setting. Dependability was strengthened through the use of audit trails documenting all stages of the research process.

Confirmability was ensured by presenting findings that accurately reflected participants' perspectives without researcher bias. Verbatim quotes, audio recordings, and researcher bracketing reinforced neutrality. Authenticity was achieved by documenting participants' true experiences using direct quotations and comprehensive field notes.

RESULTS

Description of Demographics

A total of nineteen (19) registered nurses participated in the study. Participants ranged in age from 24 to 64 years (mean = 39.2 years), with male participants averaging 35.3 years and female participants averaging 40.6 years. Experience in implementing PrEP services ranged from 2 to 8 years (mean = 5.4 years). Of the 19 participants, 3 (15.7%) were male and 16 (84.3%) were female. All participants (100%) had completed NIMART training, while 17 (89.5%) had received formal training on PrEP guidelines. The demographic characteristics of participants are summarised in **Table 1**.

Table 1:
Demographic Characteristics of Participants (N = 19)

Characteristic	n	%
Gender		
Male	3	15.8
Female	16	84.2
Age (years)		
< 35	9	47.3
≥ 35–65	10	52.6
PrEP Experience (years)		
2–4	6	31.5
5–8	13	68.4
Special Training		
NIMART	19	100
PrEP Guidelines	17	89.5
Qualification		
Diploma in Nursing	11	57.9
Degree in Nursing	2	10.5
PGDip in PHC	6	31.6

Presentation of Key Themes

Thematic analysis revealed four major themes representing interconnected systemic barriers that hinder effective PrEP implementation. These themes included workforce preparation, resource restrictions, infrastructure limitations, and challenges with information management. **Table 2** provides an overview of these themes and their associated sub-themes. The themes are further elaborated below using direct quotations to illustrate participants' experiences and perspectives.

Table 2:
Summary of Themes and Sub-Themes

Themes	Sub-themes
1. Workforce Preparation	1.1 Inadequate PrEP training
	1.2 Improper implementation
	1.3 Unwillingness to offer unfamiliar services
2. Resource Restrictions	2.1 Medication stockouts
	2.2 Equipment and materials inadequacies
	2.3 Staff shortages and overworked providers
3. Infrastructure Limitations	3.1 Insufficient consultation spaces
	3.2 Space limits impact service delivery
4. Challenges with Information Management	4.1 Poor filing systems
	4.2 Incomplete electronic records
	4.3 Poor patient tracking

Key Themes

Four major themes emerged from the interview data, illustrating how structural, resourcing, and workforce-related barriers constrained the effective implementation of PrEP guidelines. These themes—workforce preparedness, resource constraints, infrastructure limitations, and information management challenges—highlight the interdependence of individual readiness, institutional support, and the broader health system context in which PrEP services are delivered.

Theme One: *Workforce Preparation to Implement PrEP Guidelines*

Participants frequently reported feeling inadequately prepared to deliver PrEP services. The lack of formal training, inconsistent implementation practices across facilities, and hesitation to assume new or unfamiliar responsibilities were recurring concerns. Many nurses described feeling more confident with HIV treatment than with PrEP-specific tasks. Limited training and insufficient ongoing support negatively affected confidence, service delivery, and consistency across clinics.

Sub-theme 1: Inadequate PrEP Training

Participants expressed concern that they had not received the appropriate training before being expected to provide PrEP services. Although all were trained in HIV treatment, many felt that this did not sufficiently prepare them for the distinct requirements of PrEP implementation. This gap led to uncertainty, diminished confidence, and inconsistency in service delivery. Participants described this as follows:

"No, we were not adequately prepared for the implementation. We did not receive proper training on PrEP. We were simply instructed that this is what we must do and how we were expected to begin." (P1, 37-year-old, Female)

"I was not fully prepared until I obtained more information from the person who initially started this implementation… After interacting with the PrEP promoter in the clinic, I was able to obtain the necessary information." (P5, 64-year-old, Female)

"We were not prepared for the implementation… We were told that this is what we must do and how we were expected to begin." (P1, 37-year-old, Female)

Sub-theme 2: Improper Implementation

Several participants noted that PrEP implementation began abruptly, without adequate planning or preparatory support. Despite PrEP being integrated into existing services, many nurses reported receiving insufficient guidance, resources, or practical assistance. This resulted in uncertainty and inconsistent practices across facilities.

Participants explained:

"We were not adequately prepared. The programme was simply introduced to us, and we were instructed to start issuing PrEP to patients… only three of us were trained." (P9, 43-year-old, Male)

"I cannot say that I was fully prepared, but as a NIMART-trained professional with experience, I took the initiative and initiated patients on PrEP using NIMART information." (P19, 49-year-old, Female)

Sub-theme 3: Unwillingness to Offer Unfamiliar Services

Some nurses expressed reluctance to initiate PrEP due to limited confidence, insufficient training, and fear of making clinical errors. This uncertainty contributed to avoidance of PrEP responsibilities and reliance on external or designated staff. One participant stated:

"I am not comfortable initiating patients on PrEP… there is a designated individual from ANOVA responsible for both PrEP and ART initiations." (P1, 37-year-old, Female)

Theme Two: *Resource Restrictions*

Participants described critical shortages in medication, equipment, and staff as major systemic barriers. Frequent stockouts disrupted continuity of care, while inadequate equipment and excessive workloads hindered efficient service delivery. These resource constraints created a fragile environment in which maintaining consistent PrEP services was difficult.

Sub-theme 1: Medication Stockouts

Frequent stockouts of PrEP medication significantly affected nurses' ability to initiate and maintain clients on PrEP. Participants reported needing to reduce medication quantities dispensed or rely on partner organisations for emergency supplies:

"We do experience shortages; however, when stock is low, we sometimes provide a one-month supply and advise patients to return when they are running out." (P4, 36-year-old, Female)

"Medication stockout happens weekly… the treatment we are having is from ANOVA because we don't have stock in the clinic." (P11, 24-year-old, Female)

Sub-theme 2: Equipment and Materials Inadequacies

Participants experienced substantial shortages of essential clinical equipment and administrative materials. Inadequate access to functioning BP machines, weighing scales, and photocopy machines slowed workflow and interfered with patient initiation processes:

"In this facility we have only one BP machine, one scale, so it is not easy to accommodate everyone." (P9, 43-year-old, Male)

"We do have stationery, but we are still facing challenges with the photocopy machine… Fortunately, other facilities have been able to assist us." (P8, 31-year-old, Male)

"We run out of stationery often and sometimes it is difficult to initiate patients, especially when the facility photocopy machine is not functioning." (P1, 37-year-old, Female)

Sub-theme 3: Staffing shortages and overworked providers

The implementation of PrEP services was significantly undermined by persistent shortages of professional nursing staff. Participants described being overwhelmed by

competing responsibilities across several service areas, which made it difficult to prioritise PrEP delivery. Reduced counselling time, delays in service provision, and interruptions in patient care were common outcomes of inadequate staffing levels, particularly when colleagues were on leave. These constraints created an environment in which the sustainable delivery of PrEP became challenging. This was reflected in participants' statements:

"We don't have enough human resources. We have only six professional nurses working in this facility. We have other services to render such as acute care, antenatal care, mother-and-child services, as well as emergencies." (P8, 31-year-old, Male)

"Staff shortage, especially with professional nurses. It becomes difficult to cope with the workload of patients, especially when other nurses are on leave." (P1, 37-year-old, Female)

Theme Three: *Infrastructure limitations*

The lack of adequate physical infrastructure emerged as a major impediment to the effective implementation of PrEP services. Participants described how crowded premises, insufficient consultation rooms, and deteriorating service areas compromised privacy and contributed to suboptimal patient experiences. These infrastructural shortcomings intersected with existing resource and workforce constraints, creating additional strain on facilities attempting to deliver consistent PrEP services.

Sub-theme 3.1: Insufficient consultation spaces

Participants repeatedly expressed concern regarding the shortage of private consultation rooms. Nurses were often compelled to improvise by using shared spaces or ageing portable units, which compromised confidentiality and made it difficult to offer client-centred care. Overcrowding and high patient volumes further magnified these challenges. The following quotes illustrate these concerns:

"The clinic is quite small, and the consulting rooms are insufficient. We have a high number of patients, which sometimes makes it challenging to provide services to everyone." (P2, 27-year-old, Female)

"There is limited capacity and space. Our clinic is very small, and HTS counsellors have to work in deteriorating containers that cannot accommodate many patients." (P11, 24-year-old, Female)

Sub-theme 3.2: Space limits impact service delivery

Participants also highlighted how structural constraints and limited physical capacity impeded effective patient flow and hampered the clinic's ability to scale up PrEP services. The inability to accommodate additional clients undermined consistency in service delivery and intensified existing pressures. Nurses voiced concern that their facilities were not equipped to meet the growing demand for PrEP, as reflected below:

"Our clinic is very old and small. It cannot accommodate more patients as the existing space is already insufficient for those currently receiving care." (P2, 28-year-old, Female)

"I don't believe the facility has enough space to accommodate additional patients. It is already struggling to accommodate the patients currently arriving." (P1, 37-year-old, Female)

Theme Four: *Challenges with information management*

Inefficiencies in information management systems were identified as major barriers to effective PrEP delivery. Participants described substantial weaknesses in filing systems, electronic record-keeping, and patient tracking processes, all of which undermined continuity of care. Fragmented documentation, missing files, and inconsistencies in electronic data entry contributed to gaps in follow-up, incomplete patient histories, and poor programme monitoring.

Sub-theme 1: Poor filing systems

Participants expressed deep concern about disorganised and poorly maintained paper-based filing systems. Missing files, inadequate documentation, and general disorder within record rooms frequently disrupted service delivery and delayed patient care. These administrative shortcomings were often attributed to overburdened clerical teams and understaffing. Participants explained:

"The main challenge here is the filing of patient records, which is done by administrative clerks. Files are not well organised, and many files are missing." (P6, 60-year-old, Female)

"Filing is disorganised. When patients return for follow-ups, their files are often missing. The majority of patients are not properly recorded on Tier.net." (P11, 24-year-old, Female)

Sub-theme 2: Incomplete electronic records

Several participants noted significant deficiencies in the use of electronic health systems, particularly Tier.net. Patients

were sometimes not accurately captured in the system, resulting in incomplete data during subsequent visits. Technical challenges, including system downtime, further impeded accurate electronic documentation. These gaps created uncertainty and affected the reliability of patient monitoring. Participants stated:

"No, I would say no, because there are instances where a patient returns for a follow-up, whether for PrEP or ART, and their file cannot be found. When checking Tier.net, the patient does not appear, indicating that they were not properly recorded in the system." (P16, 48-year-old, Female)

"I'm unsure whether the issue lies with the system itself or if not everyone is being properly recorded. At times, the system goes down, making it difficult to capture patient information." (P18, 31-year-old, Female)

Sub-theme 3: Poor patient tracking

Participants also reported pervasive challenges with tracking patients throughout different stages of care. Weak integration between services—such as PrEP, ART, and maternal health—combined with inconsistent documentation, often led to patients being lost to follow-up. These gaps were particularly evident among postpartum mothers and highly mobile clients. The following quotes highlight these concerns:

"I don't think all patients are recorded on Tier. Sometimes a patient is initiated, but after 28 days, their file is missing. As a result, we are left uncertain about the whereabouts of the file, and the patient is not reflected on Tier.net." (P14, 52-year-old, Female)

"Women receive postnatal care at the mother-and-child section. The challenge at this stage is that a new file is opened, and if the healthcare provider does not ask the mother about PrEP or other chronic medications she is taking, and the patient does not request PrEP, it can easily be overlooked." (P6, 60-year-old, Female)

DISCUSSION

This study identified critical systemic and workforce-related barriers that hinder the effective implementation of PrEP guidelines in public healthcare settings. The thematic analysis revealed four interrelated domains affecting PrEP delivery: workforce preparedness, resource constraints, infrastructural limitations, and shortcomings in information management. These findings highlight structural weaknesses that undermine the potential of PrEP as an HIV prevention strategy and point to the need for coordinated, system-level interventions to strengthen programme effectiveness.

Workforce Preparedness for PrEP Implementation

Workforce preparedness emerged as a major challenge, with many nurses indicating that they began implementing PrEP services without adequate training. This lack of preparation led to uncertainty, clinical hesitancy, and diminished job satisfaction. Similar deficits have been documented across low- and middle-income countries (LMICs). In Sub-Saharan Africa, Kiguli-Malwadde et al. (2022) demonstrated that structured, ongoing training in HIV service provision significantly improves provider confidence and service quality. Evidence from Kenya also suggests that insufficient training contributes to inconsistent PrEP delivery (Kasal et al., 2024), while findings from Lesotho show that dependence on a small cadre of trained personnel, poor supervision, and ill-defined clinical responsibilities limit PrEP expansion (Geldsetzer et al., 2022). Studies from Thailand, Brazil, and even high-income settings such as Canada similarly confirm that without continuous professional development, provider readiness to adopt new HIV prevention guidelines remains inadequate (Sidebottom et al., 2018; Grangeiro et al., 2020).

The consequences of inadequate staffing and planning were also felt by patients. Long waiting times, driven by staff shortages and unequal workloads, contributed to poor patient experience and reduced retention. In South Africa, such delays have previously led patients to arrive at clinics before dawn to secure care (Ntimani et al., 2025; Martin et al., 2023). Comparable observations in Ghana and Nigeria further show that prolonged waiting times erode patient trust and compromise adherence to HIV prevention interventions (Apreku et al., 2025; Onigbogi et al., 2024). These patterns, consistent across LMICs, underscore how deficiencies in workforce planning weaken both provider performance and patient engagement.

To support effective implementation of South Africa's HIV, TB and STIs National Strategic Plan (2023–2028), targeted investment in staff capacity, clinical supervision, and institutional support is essential. Evidence from LMICs consistently shows that scaling up biomedical interventions

without corresponding health system strengthening undermines long-term programme sustainability. Given that nurses form the backbone of primary healthcare, they require ongoing training, clear role allocations, and supportive working environments to sustain their expanded responsibilities in HIV prevention.

Resource Restrictions

Resource limitations were identified as a further barrier to PrEP roll-out. Frequent stockouts of PrEP medications disrupted service continuity and undermined patients' confidence in the healthcare system. This challenge is not unique to South Africa; similar medication shortages have been documented in Uganda, Malawi, and Zimbabwe, where interruptions in supply led to missed HIV prevention opportunities (Lugada, 2022; Nyondo-Mipando et al., 2021; Chagoma et al., 2023). Reliance on external partners, such as the ANOVA Health Institute, to bridge supply gaps reflects weaknesses in local procurement systems—a common problem in many LMICs.

Beyond medication shortages, several facilities also lacked basic medical and administrative supplies such as blood pressure cuffs, weighing scales, and stationery. These deficiencies impeded clinical assessment, documentation, and programme monitoring. Evidence from Malawi, Vietnam, and Peru similarly shows that poorly resourced clinics deliver lower-quality services and experience higher patient attrition (Nyondo-Mipando et al., 2021; Hoang et al., 2022; Galea et al., 2022). Human resource shortages compounded these challenges, with nurses frequently required to manage ART, maternal health services, ambulance duties, and PrEP simultaneously. Comparable task overload in Kenya and rigid staffing models in Zimbabwe have been shown to weaken HIV prevention efforts (Mburu et al., 2019; Chagoma et al., 2023). Collectively, these findings demonstrate how understaffing, insufficient equipment, and fragile supply chains jointly undermine PrEP scale-up in resource-limited settings.

Infrastructure Limitations

Inadequate infrastructure emerged as another significant barrier to PrEP implementation. The absence of designated consulting rooms compromised confidentiality, patient flow, and overall comfort, discouraging both patients and providers. Similar infrastructural deficiencies have been widely reported in South Africa, where overcrowding, underinvestment, and spatial constraints hinder confidential HIV prevention services (Malakoane et al., 2020; Rasesemola, 2023). International evidence from the United States and Nigeria also indicates that patients often avoid or delay PrEP uptake in facilities that appear overcrowded, stigmatising, or poorly maintained (Emmanuel et al., 2020; Aidoo-Frimpong et al., 2020).

Nurses in the present study described structural limitations as a major impediment to providing private and consistent care. Such challenges also affect staff morale by obstructing their ability to deliver quality services. Similar findings from Bahrain show that poor infrastructure discourages healthcare workers from participating in new HIV initiatives (Abdulla et al., 2022). Regardless of staff motivation or patient demand, inadequate physical space fundamentally restricts the scope of PrEP implementation.

Challenges in Information Management

Deficiencies in information management further constrained PrEP delivery. Inefficient filing systems, incomplete electronic records, and inconsistent data entry practices disrupted continuity of care and impeded programme evaluation. These challenges mirror those documented in Malawi, South Africa, and Tanzania, where unreliable electronic health record (EHR) data hindered monitoring and decision-making (Chirambo et al., 2019; Luwanda et al., 2021). Fragmented record-keeping systems in Mozambique and Nigeria similarly impeded patient tracking and follow-up (Ajayi et al., 2021; da Silva et al., 2019).

South Africa's TIER.Net system, although designed to enhance HIV data management, has faced operational challenges due to limited human resources, insufficient training, and high workloads—factors that also distort programme indicators in other LMIC settings (Etoori et al., 2020; Wani et al., 2024). While some evidence suggests that digital systems improve service delivery when adequately supported (Kaboré, 2022), the present findings reaffirm that technology is only as effective as the organisational capacity that supports it. Jamieson et al. (2019) similarly found that despite sound technical design, TIER.Net's effectiveness was constrained by personnel capability and inconsistent

implementation. Strengthening data quality, integration, and follow-up mechanisms must therefore remain a priority for South Africa and other resource-limited settings.

Implications for Policy and Practice

Collectively, the findings highlight the need for a multifaceted, system-level approach to strengthening PrEP implementation. Addressing the identified barriers requires several coordinated actions. First, standardised and scalable PrEP training programmes should be established to ensure that all nurses receive comprehensive, competency-based preparation complemented by ongoing mentorship and supportive supervision. Such measures will enhance provider confidence and clarify professional roles.

Second, robust resource management strategies are essential. Strengthening procurement systems will reduce medication stockouts and ensure stable availability of essential clinical and administrative supplies. Strategic human resource planning is also needed to allocate staffing more efficiently and reduce excessive workload burden.

Third, infrastructural investment is required to improve clinic environments. Upgrading buildings, expanding facilities, and creating dedicated consultation spaces will protect patient privacy, streamline service delivery, and promote a person-centred approach to care.

Fourth, enhancements to health information systems are urgently needed. Improving the usability and integration of electronic health records, standardising data entry procedures, and conducting routine quality checks will support accurate monitoring, timely follow-up, and evidence-based decision-making. Complementary training for staff will further strengthen digital literacy and promote systematic patient tracking.

Finally, these measures must be embedded within national policy frameworks. Integrating system-strengthening interventions into South Africa's National Strategic Plan and ensuring dedicated funding and multisectoral coordination will sustain the scale-up of PrEP services. Policies should also institutionalise structured implementation plans, mentorship systems, and supportive supervisory mechanisms to ensure long-term programme stability.

CONCLUSION

This study highlights critical systemic and workforce barriers affecting the implementation of PrEP guidelines in high HIV-burden public health facilities in Gauteng, South Africa. Staff shortages, resource constraints, infrastructural limitations, and weaknesses in information management collectively hinder the consistent, confidential, and person-centred delivery of PrEP services. Addressing these challenges requires long-term investment in training, resources, infrastructure, and health system digitisation. Sustainable scale-up will depend on embedding these interventions within national HIV prevention policies and ensuring coordinated monitoring and support. Prioritising health system strengthening and frontline nursing support is essential for realising South Africa's HIV elimination goals and ensuring equitable, high-quality access to PrEP for key populations.

Acknowledgements: The authors express their sincere appreciation to Sefako Makgatho Health Sciences University for the opportunity to conduct this research, to the Johannesburg Health District for granting access to the participating facilities, and to all study participants for their valuable contributions.

Ethical Approval: Ethical clearance for this study was granted by the Sefako Makgatho Health Sciences University Research Ethics Committee (SMUREC/H/485/2023:PG).

Conflicts of Interest: None declared.

ORCID iDs:

Ntimani, J. M.: https://orcid.org/0000-0003-0258-3038
Mokoena-de Beer, A. G.: https://orcid.org/0000-0002-6156-6812
Phetlhu, D. R.: https://orcid.org/0000-0002-9502-6486

REFERENCES

Abdool Karim, S. S., Churchyard, G. J., Karim, Q. A., & Lawn, S. D. (2009). HIV infection and tuberculosis in South Africa: An urgent need to escalate the public health response. *Lancet*, 374(9693), 921–933. https://doi.org/10.1016/S0140-6736(09)60916-8

Abdulla, N. M., Naqi, R. J., & Jassim, G. A. (2022). Barriers to nurse-patient communication in primary healthcare centers in Bahrain: Patient perspective. *International Journal of Nursing Sciences*, 9(2), 230–235. https://doi.org/10.1016/j.ijnss.2022.03.006

Aidoo-Frimpong, G., Wilson, K., & Przybyla, S. (2020). Factors influencing pre-exposure prophylaxis uptake among current users: A qualitative study. *Journal of HIV/AIDS & Social Services*, 19(3), 252–262. https://doi.org/10.1080/15381501.2020.1810838

Ajayi, S., Wamae, P., & Muthee, D. (2021). Implementation of Electronic Medical Records for service delivery in selected state hospitals in Southwest Nigeria. *International Journal of Current Aspects*, 5(2), 75–94. https://doi.org/10.35942/ijcab.v5i2.174

Apreku, A., Guure, C., Dery, S., Yakubu, A., Abu-Ba'are, G. R., Addo, S. A., & Torpey, K. (2025). Awareness, willingness, and uptake of pre-exposure prophylaxis (PrEP) among men who have sex with men in Ghana. *BMC Infectious Diseases*, 25(1), 213. https://doi.org/10.1186/s12879-025-10614-1

Bavinton, B. R., & Grulich, A. E. (2021). HIV pre-exposure prophylaxis: Scaling up for impact now and in the future. *The Lancet Public Health*, 6(7), e528–e533. https://doi.org/10.1016/S2468-2667(21)00112-2

Braun, V., & Clarke, V. (2021). Thematic analysis: A practical guide. SAGE Publications.

Brink, H., Van der Walt, C., & Van Rensburg, G. (2020). Fundamentals of research methodology for healthcare professionals (5th ed.). Juta and Company Ltd.

Chirambo, L., Valeta, M., Banda Kamanga, T. M., & Nyondo-Mipando, A. L. (2019). Factors influencing adherence to antiretroviral treatment among adults accessing care from private health facilities in Malawi. *BMC Public Health*, 19(1), 1382. https://doi.org/10.1186/s12889-019-7768-z

da Silva, M., Blevins, M., Wester, C. W., Manjolo, J., José, E., Gonzalez, L. C., Shepherd, B. E., Moon, T. D., & Vaz, L. M. (2015). Patient loss to follow-up before antiretroviral therapy initiation in rural Mozambique. *AIDS and Behavior*, 19(4), 666–678. https://doi.org/10.1007/s10461-014-0874-0

Department of Health (DoH). (2021). Guidelines for the provision of Pre-Exposure Prophylaxis (PrEP) to persons at substantial risk of HIV infection. Pretoria: South African National Department of Health.

Donabedian, A. (1980). The definition of quality and approaches its assessment. Health Administration Press.

Emmanuel, G., Folayan, M., Undelikwe, G., Ochonye, B., Jayeoba, T., Yusuf, A., Aiwonodagbon, B., Bilali, C., Umoh, P., Ojemeiri, K., & Kalaiwo, A. (2020). Community perspectives on barriers and challenges to HIV pre-exposure prophylaxis access by men who have sex with men and female sex workers in Nigeria. *BMC Public Health*, 20(1), 69. https://doi.org/10.1186/s12889-020-8195

Etoori, D., Wringe, A., Kabudula, C. W., Renju, J., Rice, B., Gómez-Olivé, F. X., & Reniers, G. (2020). Misreporting of patient outcomes in the South African national HIV treatment database: Consequences for programme planning, monitoring, and evaluation. *Frontiers in Public Health*, 8, 100. https://doi.org/10.3389/fpubh.2020.00100

Galea, J. T., Wong, M., Ninesling, B., Ramos, A., Senador, L., Sanchez, H., Kolevic, L., Matos, E., Sanchez, E., … & Jackson, D. (2022). Patient and provider perceptions of a community-based accompaniment intervention for adolescents transitioning to adult HIV care in urban Peru: A qualitative analysis. *Journal of the International AIDS Society*, 25(10), e26019. https://doi.org/10.1002/jia2.26019

Geldsetzer, P., Chebet, J. J., Tarumbiswa, T., Phate-Lesihla, R., Maponga, C., Mandara, E., Bärnighausen, T., & McMahon, S. A. (2022). Knowledge and attitudes about HIV pre-exposure prophylaxis: Evidence from in-depth interviews and focus group discussions with policymakers, healthcare providers, and end-users in Lesotho. *PLOS Global Public Health*, 2(10), e0000762. https://doi.org/10.1371/journal.pgph.0000762

Grangeiro, A., Massa, P. A., Escuder, M. M., Zucchi, E. M., Sala, E. A., Oliveira, E. A., Fini, R., Dourado, I., Magno, L., Leite, B. O., Bruxvoort, K., MacCarthy, S., Couto, M. T., & Peres, M. F. T. (2024). PrEP provision in community organizations: A comparative study with conventional services. *Revista de Saúde Pública*, 58(Suppl 1), 9s. https://doi.org/10.11606/s1518-8787.2024058005914

Hoang, N. T., Foo, T. J., Tran, B. X., Do, N. T., Vu, G. T., Nguyen, C. T., Pham, H. Q., Latkin, C. A., Ho, C. S. H., & Ho, R. C. M. (2022). Structural barriers for

retention of HIV/AIDS patients after initiating antiretroviral therapy in outpatient clinics of Vietnam. *AIDS Care*, 34(8), 992–999. https://doi.org/10.1080/09540121.2021.1929816

Jamieson, L., Evans, D., Berhanu, R., Ismail, N., Aucock, S., Wallengren, K., & Long, L. (2019). Data quality of drug-resistant tuberculosis and antiretroviral therapy electronic registers in South Africa. *BMC Public Health*, 19, 1638. https://doi.org/10.1186/s12889-019-7965-9

Kaboré, S. S., Ngangue, P., Soubeiga, D., Barro, A., Pilabré, A. H., Bationo, N., Pafadnam, Y., Drabo, K. M., Hien, H., & Savadogo, G. B. L. (2022). Barriers and facilitators for the sustainability of digital health interventions in low and middle-income countries: A systematic review. *Frontiers in Digital Health*, 4, 1014375. https://doi.org/10.3389/fdgth.2022.1014375

Kasal, N., Devlin, S., Johnson, A. K., Dawdani, A., Enaholo, O. E., Liegeon, G., Pyra, M., Hirschhorn, L. R., Haider, S., Ducheny, K., Simon, J., & Ridgway, J. P. (2024). Increasing providers' PrEP prescription for Black cisgender women: A qualitative study to improve provider knowledge and competency via PrEP training. *Women's Health*, 20, 17455057241277974. https://doi.org/10.1177/17455057241277974

Kiguli-Malwadde, E., Forster, M., Martin, S., Chilemba, E., Couper, I., Motlhatlhedi, K., Celentano, J., Haruzivishe, C., Sears, D., Budak, J. Z., Khanyola, J. N., Von Zinkernagel, D., Molwantwa, M., Semitala, F., de Villiers, M., Reid, M., & Kazembe, A. (2022). Evaluating the impact of a multicountry interprofessional training programme to improve HIV knowledge and clinical confidence among healthcare workers in sub-Saharan Africa: A cohort study. *BMJ Open*, 12(7), e060079. https://doi.org/10.1136/bmjopen-2021-060079

Lugada, E., Komakech, H., Ochola, I., Mwebaze, S., Olowo Oteba, M., & Okidi Ladwar, D. (2022). Health supply chain system in Uganda: Current issues, structure, performance, and implications for systems strengthening. *Journal of Pharmaceutical Policy and Practice*, 15, 14. https://doi.org/10.1186/s40545-022-00412-4

Luwanda, L. B., Vyas, S., Songo, J., Chimukuche, R. S., McLean, E., Hassan, F., Schouten, E., Todd, J., Geubbels, E., Wringe, A., & Renju, J. (2021). Assessing the implementation of facility-based HIV testing policies in Malawi, South Africa, and Tanzania from 2013–2018: Findings from SHAPE-UTT study. *Global Public Health*, 16(2), 241–255. https://doi.org/10.1080/17441692.2020.1763420

Martin, C. E., Cox, L. A., Nongena, P., Butler, V., Ncube, S., Sawry, S., & Mullick, S. (2023). Patterns of HIV pre-exposure prophylaxis use among adolescent girls and young women accessing routine sexual and reproductive health services in South Africa. *The Journal of Adolescent Health*, 73(6S), S81–S91. https://doi.org/10.1016/j.jadohealth.2023.08.004

Mburu, M., Guzé, M. A., Ong'wen, P., Okoko, N., Moghadassi, M., Cohen, C. R., Bukusi, E. A., & Wolf, H. T. (2019). Evaluating the effectiveness of the HIV adolescent package of care (APOC) training on viral load suppression in Kenya. *Public Health*, 173, 146–149. https://doi.org/10.1016/j.puhe.2019.05.026

Milimu, J. W., Parmley, L., Matjeng, M., Madibane, M., Mabika, M., Livingston, J., Lawrence, J., Motlhaoleng, O., Subedar, H., Tsekoa, R., & Mthembu, Z. (2024). Oral pre-exposure prophylaxis implementation in South Africa: A case study of USAID-supported programs. *Frontiers in Reproductive Health*, 6, 1473354. https://doi.org/10.3389/frph.2024.1473354

Milford, C., Mofokeng, R., Greener, L. R., Nel, A., Smit, J., & Malherbe, M. (2024). Self-reported removal and expulsion of the dapivirine vaginal ring in South Africa: A cross-sectional study. *BMC Public Health*, 24(1), 18795. https://doi.org/10.1186/s12889-024-18795-1

Nesengani, T. V., Downing, C., & Ten Ham-Baloyi, W. (2025). Barriers to effective patient care as experienced by nurses in primary healthcare clinics in African countries: A systematic review of qualitative studies. *BMC Nursing*, 24(1), 232. https://doi.org/10.1186/s12912-025-02877-5

Ntimani, J. M., Mokoena-De Beer, A. G., & Phetlhu, D. R. (2025). Delivery models of HIV pre-exposure prophylaxis and their influence on uptake in South Africa: An integrative review. *Southern African Journal of HIV Medicine*, 26(1), a1684. https://doi.org/10.4102/sajhivmed.v26i1.1684

Nyondo-Mipando, A. L., Chirwa, M., Kumitawa, A., Salimu, S., Chinkonde, J., Chimuna, T. J., Dohlsten, M., Chikwapulo, B., Senbete, M., Gohar, F.,

Hailegebriel, T. D., & Jackson, D. (2023). Uptake of, barriers and enablers to the utilization of postnatal care services in Thyolo, Malawi. *BMC Pregnancy and Childbirth*, 23(1), 271. https://doi.org/10.1186/s12884-023-05587-5

Onigbogi, O., Eghaghe, O. N., Onigbogi, M., Ojo, O. Y., & Babalola, O. F. (2024). Assessing awareness and utilisation of pre-exposure prophylaxis for HIV prevention among women who inject drugs in Lagos, Nigeria: A cross-sectional study. *BMJ Public Health*. https://doi.org/10.1136/bmjph-2023-000293