TITLE: FACTORS IMPACTING HIV PRE-EXPOSURE PROPHYLAXIS UPTAKE AND COVERAGE AMONG AT-RISK POPULATIONS IN WEST AFRICA: A SCOPING REVIEW

AUTHORS NAMES

JULIUS CUDJOE [1,2,3*](ORCID iD: https://orcid.org/0009-0004-9260-4692) ,

WISDOM KWABLA ATATSI[1,2,4] (ORCID iD: https://orcid.org/0009-0009-5203-1574)

[1] Public Health Institute, Liverpool John Moores University, Liverpool, UK.

[2] UNICAF University, Cyprus

[3] True Faith Health Services, Kumasi, Ghana

[4] University Hospital Sharjah, University City, Sharjah, United Arab Emirates.

***Correspondence*:** Julius Cudjoe – Email: juliuscudjoe9@gmail.com

Address: True Faith Health Services, Kumasi, Ghana

Mobile Number: +233(0) 54 165 5600

NB: This is a preprint which was submitted to the Global Health: Science and Practice Journal for Peer-review

ABSTRACT

Introduction: Various PrEP projects and studies have been centered in Western Africa, as a result of high incidence of HIV in recent times, which explore various facets needed to be looked at in improving PrEP uptake and coverage particularly among high-risk populations, a key measure in helping to fight the HIV pandemic.

Objectives: This scoping review explores available evidence, outlining the factors and affecting HIV PrEP uptake and coverage among vulnerable and key populations in West Africa.

Methodology: This study adopted Arksey and O'Malley's (2005) scoping review framework for conducting the scoping review. A search was conducted on four digital databases – Scopus, ScienceDirect, PubMed, and Google Scholar - from January 2013 to December 2023. The PRISMA flow diagram was utilized and data were analyzed through thematic content analysis, following the socio-ecological model.

Results: Thirty-seven studies were included in this review that met the eligibility criteria. 24 of these studies were conducted among MSM and 12 were conducted among FSW. 12 and 10 of the 37 studies reported on PrEP awareness and knowledge respectively. Awareness as reported by these studies was generally low among high-risk populations, however, 17 of the 37 studies reported high willingness and intention to take up PrEP following its introduction and education.

From the study, facilitating factors that helped increase the uptake and usage of PrEP in the study were individual facilitators such as perception of high risk, having a good understanding of PrEP and HIV interpersonal factors such as peer education and support, and environmental factors like convenient access to PrEP and services tailored for at-risk populations.

Barriers to PrEP included personal obstacles like money issues and socioeconomic uncertainties, as well as social barriers like stigma and the belief that taking PrEP means having HIV, and environmental barriers logistical constraints in providing services, stigma, and lack of healthcare setting motivation.

Conclusion: PrEP as a preventive tool holds much promise in the fight against HIV, however, high- risk populations in West Africa for whom PrEP is mainly intended for still demonstrate low level of awareness and knowledge with various barriers to its use accounting for this. Therefore, in order to encourage facilitators and address barriers to PrEP uptake and usage, it is necessary to expand PrEP sensitization programs and tailor PrEP delivery services.

Keywords: Pre-Exposure Prophylaxis, PrEP, HIV, High-Risk Populations, West Africa,

INTRODUCTION

The efficacy of Pre-Exposure Prophylaxis (PrEP) was initially demonstrated in 2010 through a randomized control trial, showing a 41% decrease in HIV transmission risk when consistently used by men who have sex with men (MSM) and transgender women (TGW) who have sex with men.[1] Subsequent studies also indicated its effectiveness in reducing risk among other high-risk populations such as PWID, heterosexual couples, serodiscordant couples, and sex workers.[2] The success of PrEP is however reliant on how well individuals adhere to the recommended regimen, which can be hindered by factors such as willingness and acceptance of taking oral PrEP.[3,4,5] Studies indicate that PrEP usage significantly increased from 6% to 35% among MSM in 20 major US cities, leading to a 30% average decrease in HIV infections in those areas.[6] Between 2014 and 2019, the use of PrEP, along with more testing and treatment, has led to an 8% decrease in HIV incidence.[7]

PrEP availability and execution are however not uniform and, similar to HIV, disproportionately impact certain groups due to various contributing factors. In order to ensure that everyone who could benefit from it has access, it is important to address the inequalities in PrEP coverage.[8]

Setbacks and facilitators to PrEP coverage, implementation, and acceptance among vulnerable groups affect various aspects of policy, decision-making, investments, stakeholders, policy implementation, healthcare providers, facilities, and socio-economic, cultural, religious, moral, and racial influences. For example, it has been observed that providing continuous counseling and support for HIV prevention to participants can lead to more favorable outcomes than not providing such a framework and a study (HPTN 073 among MSM) in America focusing on MSM and Transgender individuals found that adherence to the regimen was highest among groups who were informed about their higher risk of acquiring HIV.[2]

A lot more of these barriers to PrEP uptake and use continue to throw more light on the various social determinants of health fueling disparities in PrEP use and these include a low level of knowledge and awareness about PrEP, socio-economic vulnerabilities, stigma faces by most at-risk populations, systemic racism which as well put most vulnerable groups at high risk of HIV acquisition whilst at the same time impeding on access to HIV preventive services.[7,8]

In most developing countries, the concept of PrEP is still relatively novel and though various PrEP projects and research studies has proven its efficacy, it is noted that there are marked knowledge gaps and limited number of policies as well as interventions which pay focus to persistently sensitizing high-risk and key populations.[9] In Sub-Saharan Africa, the subject of HIV still faces marked stigma and discrimination and coupled with various criminal prejudices and injustices that are faced by individuals tagged as being members of certain vulnerable communities including LGBTQIA+ community and sex work especially in West Africa, sometimes even access to both treatment and preventive interventions including PrEP are met with infinite impedances.[9] This was also revealed by the FEM PrEP trial and NIAID-supported VOICE study,[2] where participants faced challenges in taking medications as prescribed with reasons cited as not fitting their lifestyles. Also in southern Africa, studies by NIAID revealed that, participants who were educated on the safety and efficacy of PrEP recorded higher participation and adherence,[2] and an evaluation of PrEP scale-up program as reported in a study conducted by Elizabeth-Irungu et al.,[9] revealed that it was achievable, implementing and integrating PrEP in health-care settings, though, it also reported on various barriers that served as hindrances to its upscale and recommended it be the focus of stakeholders and policy makers.

Focusing on HIV preventive strategies, it is noted that, at risk populations, according to the WHO in 2016,[10] should form the central focus of HIV prevention schemes and policies and therefore not

putting a priority on these groups when drawing up and implementing preventive interventions would likely result in program failure and might delimit the intended impacts of such strategies. Preventive schemes should therefore be tailor-made to suit various population needs to enhance its impact, and the perspectives of these vulnerable populations would be valuable and key input particularly for a region with limited data and research on the subject matter such as Sub-Saharan Africa which suffers disproportionately from HIV prevalence and incidence.[11]

Even for sub-Saharan Africa there still are marked differences in prevalence in various regions and among various populations. Western, Central and Northern Africa records a relatively lower incidence and prevalence compared to Eastern and Southern Africa.[12,-14] However in recent times, the incidence in West Africa is increasingly becoming alarming,[12-14] though research studies on various HIV preventive measures have still not focused much on this region as compared to the vast array of studies in Southern and Eastern Africa,[15] and due to differences in socio-cultural factors, economic and legal systems as well as healthcare systems, findings from studies in one region could not necessarily be generalized to cover other regions.[15]

The scarcity of data on PrEP in Western African Region may be due to a lack of studies among high-risk populations. Southern and Eastern African countries have been the focus of research due to higher HIV prevalence and societal acceptance of diverse sexualities, making it easier to engage vulnerable groups in data collection and research.[13-16] For example, there would be marked variations in factors that either promote or hinder HIV preventive strategies uptake by MSM in South Africa a country with acceptance of diversity in sexual lifestyles compared to MSM in Ghana, where being a “queer folk” is criminalized.[12,14,17]

This scoping review sought to map out the factors impacting the awareness, uptake and adherence of HIV PrEP among vulnerable or high-risk populations in West Africa.

METHODS

This is a scoping review which employed both qualitative and quantitative research methodologies. The study aimed to determine the level of awareness and knowledge on HIV PrEP among key populations as well as map out the facilitators and barriers that affected its uptake, use and adherence based on the perspectives of these high-risk populations in West Africa. Collected data was from published studies which included articles, journals and thesis focusing on populations at risk of HIV in West Africa.

Conceptual Framework

The Social-Ecological Model (SEM) was used as the framework to group the various facilitators and barriers to PrEP use in this scoping review as it serves as a useful model in comprehensively grouping factors that influence health and health related behaviors among key populations which in turn becomes key in effectively informing interventions.[18] Factors are grouped into individual, interpersonal or environmental factors. Individual otherwise known as intrapersonal factors include those such as socio-economic status, knowledge, attitudes and behavior; interpersonal factors such as societal or social networks and support; and structural or environmental factors such as community, public policy, relationships among institutions or organizations, and culture.[18]

Study Site

Study site for this review was West Africa, a sub-region in the African continent, with 16 countries namely; Liberia, Togo, Guinea Bissau, Benin, Burkina Faso, Senegal, Mauritania, Cabo Verde, Nigeria, Mali, Ghana, The Gambia, Mauritania, Cote d'Ivoire, Seirra Leone and Saint Helena, Ascension and Tristan de Cunha.[19] This region is the western most in Africa and per UN estimates as at November, 2023, had a population of 444, 396,544.[19] Though countries in this region are

diverse they are all very rich and grounded in religious, socio-cultural and traditional roots which impact on health and health seeking behaviors as well as public health policies.[19]

Study Population

The population of interest are groups at increased risk of HIV acquisition and this includes; MSM, Transgender, PWID, sex workers, partners of PLWHIV, children, women and pregnant women in West Africa.[10] for this review, the term vulnerable, high-risk, at-risk populations were used interchangeably to denote the study population. No target-population was used during search query in order not have excluded studies examining more than one high-risk population.

Eligibility Of Research Question

The eligibility of the research question, was determined using the PIO framework-Population, Intervention and Outcome.[20] Thus from the study, the population happens to be high risk populations i.e., groups at increased risk of acquiring HIV, in West Africa. The study intervention are barriers and facilitators to PrEP awareness and use whiles outcome of study was level of PrEP awareness, use and uptake

Designs

This review was guided by the Arksey and O'Malley's methodology framework for scoping reviews[21]; outlined below;

Identifying the Research Question

The research team through consultation and a preliminary search of studies that addressed gaps in PrEP coverage between and among high-risk groups in West Africa, Africa, and the world at large, the primary research question for this scoping review was developed as defined as *"what is known*

about the factors accounting for PrEP awareness and knowledge, uptake and adherence among vulnerable or key populations in West Africa?".

Identifying Relevant Studies

In order to identify eligible studies, a comprehensive search strategy was adopted to map out data on the topic using the specified search terms: "HIV, prevention, pre-exposure prophylaxis, PrEP, uptake, knowledge, barriers, West Africa, coverage, factors, risk factors" Searches was conducted in four major databases: Scopus, ScienceDirect, PubMed, and Google Scholar. *(See additional file 1.)*

Boolean operators (AND, OR) were used to combine search terms effectively. Additionally, to capture variations in terminology, truncation was used where appropriate. The search strategy was tailored to the requirements and syntax of each database. The search took place in January, 2024.

Studies Selection

After the search, the identified articles were exported and combined in the Mendeley Reference Manager to ensure uniformity of the data. All the files were then exported to a Microsoft excel sheet through bibtex. In the Microsoft excel, all the duplicated files were removed. Following the removal of duplicates, titles and abstracts of the remaining files were screened by two independent researchers (JC and WKA) for eligibility. The eligible full-text articles were then retrieved and further assessed against all inclusion and exclusion criteria by the same reviewers.

Inclusion criteria for study selection were as follows;

i. Studies published in peer-reviewed journals
ii. Studies conducted among any, some or all at-risk populations without any age limit.
iii. Studies focusing on oral Pre-Exposure Prophylaxis or HIV preventive methods that included PrEP
iv. Studies conducted in only West African countries.
v. Studies examining factors influencing PrEP uptake, coverage, barriers, and facilitators.
vi. Studies published in English
vii. Studies Published between 2012 and 2024. Only literature published after 2012 were included in the present review, as Truvada was not approved by the FDA for PrEP until 2012.[22]

Excluded criteria used in this review were studies;

i. Conducted in countries outside West Africa.
ii. Conducted in countries that included both those in and out of West Africa.
iii. With study site being the whole of Africa.
iv. With no defined population or geographical setting.
v. That consider other HIV prevention methods except or without oral PrEP for adult population.

Charting the Data

Data extraction was conducted using a standardized form to capture relevant information from selected studies. Key data points extracted include study characteristics (e.g., author, year of publication), study design, participant demographics (e.g risk-populations-women, adolescents,

MSM, transgender, sex workers), key findings related to PrEP uptake and coverage identified in the studies.

Collating, Summarizing, and Reporting the Results

The results of the studies were gathered and summarized based on the themes that were identified, including factors that affect the adoption of PrEP, its coverage, barriers, and factors that support its use. The results were presented using the Preferred Items for Systematic Reviews and Meta-analyses Extension for Scoping Reviews (PRISMA-ScR) guidelines.[23]

To synthesize the data and identify patterns and variations across studies, a thematic analysis was carried out based on the Social-Ecological conceptual framework, and categorize key findings into similar themes to help identify dominant areas of research and any research gaps in line with study objectives. The themes of awareness, knowledge, willingness, uptake, adherence, retention, facilitators, and barriers are analyzed under individual, structural, and intrapersonal factors.[24]

A descriptive summary of the scoping review results was discussed, focusing on the key factors influencing the uptake and coverage of PrEP in West Africa, along with the barriers and facilitators found in the literature.

Table 1: PRISMA flow chart showing the study selection

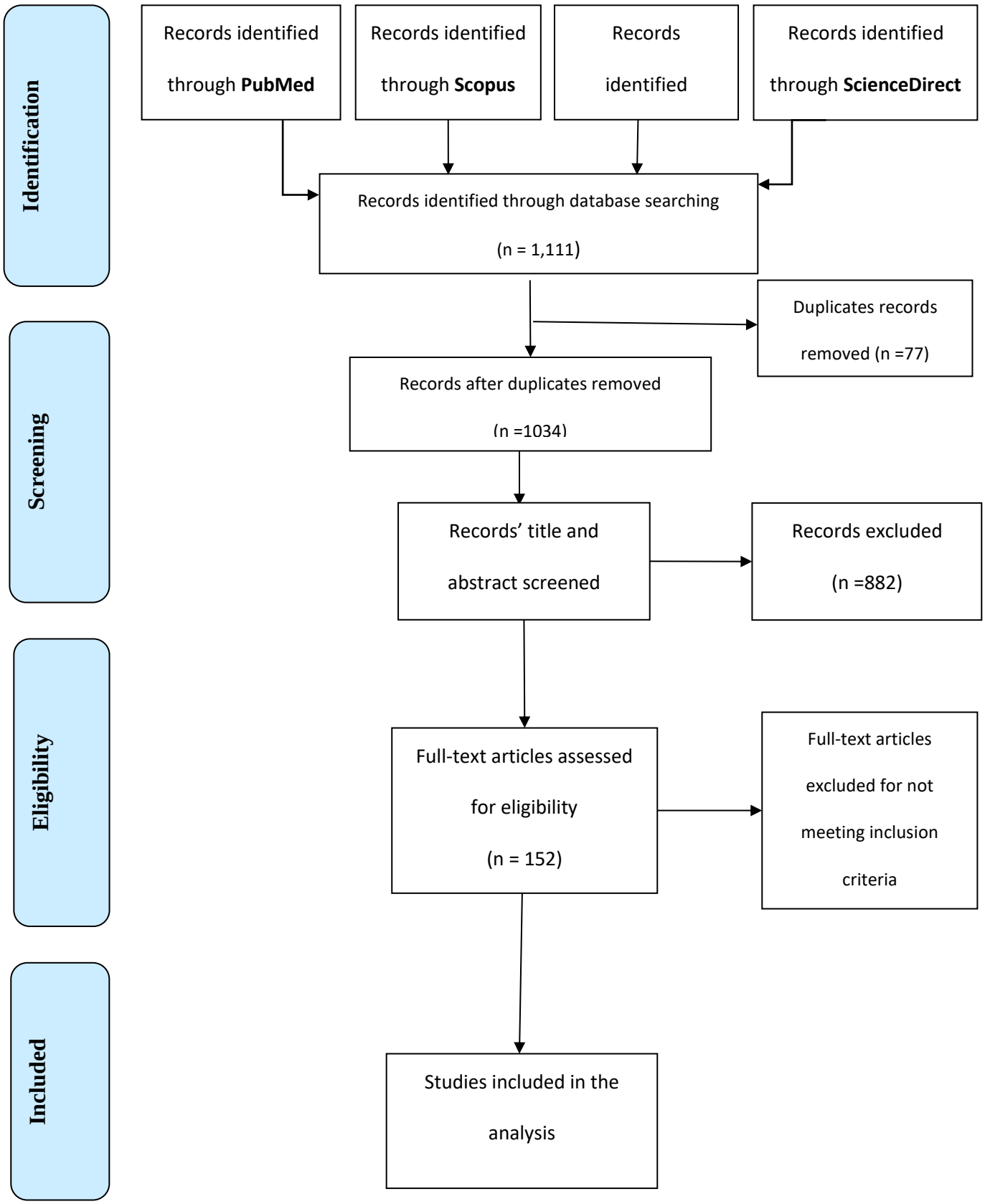

Table 2. Key Terms for Search Strategy

Concept	**Population**	**Context**
Pre-Exposure Prophylaxis	High-Risk Populations	West Africa
Pre-Exposure Prophylaxi	Key populations	Western Africa
PrEP	vulnerable groups	West African region
Pre-exposure prevention	Vulnerable populations	West Africa Countries
HIV prevention therapy	At-risk groups	Benin
HIV prevention medication	Men who have sex with men	Burkina Faso
Pre-exposure prophylactic treatment	MSM	Cape Verde
Preventive HIV medication	Female sex workers	Ivory Coast (Côte d'Ivoire)
Prophylactic HIV regimen	FSW	Gambia
	Injection drug users	Ghana
	IDUs	Guinea
	Injecting drugs	Guinea-Bissau
	Transgender	Liberia
	Incarcerated individuals	Mali
	Migrant populations	Mauritania
	Adolescents and young adults	Niger
	Serodiscordant couples	Nigeria
	People living in poverty	Senegal
	Commercial sex	Sierra Leone
	transactional sex,	Togo
	unprotected sexual activity	
	unprotected sex	
	Victims of gender-based violence	
	multiple sexual partners	
	high-risk behaviours.	

Search String for PubMed Database

1	#1	"Pre-Exposure Prophylaxis"[MeSH Terms]
2	#2	"pre exposure prophylaxi*"[Title/Abstract] OR "PrEP"[Title/Abstract] OR "Pre-exposure prevention"[Title/Abstract] OR "HIV prevention medication"[Title/Abstract] OR "pre exposure prophylactic treatment*"[Title/Abstract]
3	#3	**#1 OR #2**
4	#4	"Sexual and Gender Minorities"[MeSH Terms:noexp]
5	#5	"high risk population*"[Title/Abstract] OR "key population*"[Title/Abstract] OR "vulnerable group*"[Title/Abstract] OR "vulnerable population*"[Title/Abstract] OR "at risk group*"[Title/Abstract] OR "Men who have sex with men"[Title/Abstract] OR "MSM"[Title/Abstract] OR "female sex worker*"[Title/Abstract] OR "FSW"[Title/Abstract] OR "injection drug user*"[Title/Abstract] OR "IDUs"[Title/Abstract] OR "injecting drug*"[Title/Abstract] OR "Transgender"[Title/Abstract] OR "incarcerat*"[Title/Abstract] OR "migrant population*"[Title/Abstract] OR "serodiscordant couple*"[Title/Abstract] OR "commercial sex*"[Title/Abstract] OR "transactional sex"[Title/Abstract] OR "unprotected sex*"[Title/Abstract] OR "multiple sexual partner*"[Title/Abstract] OR "high risk behavi*"[Title/Abstract]
6	#6	**#4 OR #5**
7	#7	"West Africa"[Title/Abstract] OR "Western Africa"[Title/Abstract] OR "West African region"[Title/Abstract] OR "West Africa countr*"[Title/Abstract]
8	#8	"Benin"[Affiliation] OR "Burkina Faso"[Affiliation] OR "Cape Verde"[Affiliation] OR "Ivory Coast"[Affiliation] OR "Cote d'Ivoire"[Affiliation] OR "Gambia"[Affiliation] OR "Ghana"[Affiliation] OR "Guinea"[Affiliation] OR "Guinea-Bissau"[Affiliation] OR "Liberia"[Affiliation] OR "Mali"[Affiliation] OR "Mauritania"[Affiliation] OR "Niger"[Affiliation] OR

		"Nigeria"[Affiliation] OR "Senegal"[Affiliation] OR "Sierra Leone"[Affiliation] OR "Togo"[Affiliation]
9	#9	**#7 OR #8**
10	#10	**#3 AND #6 AND #9**
11	#11	**#3 AND #6 AND #9** Filters: **English**
12	#12	**#3 AND #6 AND #9** Filters**: English, from 2013/1/1 - 2023/12/31**

Search String for Scopus Database

Scopus	(TITLE-ABS-KEY ("Pre-Exposure Prophylaxi*") OR TITLE-ABS-KEY (prep) OR TITLE-ABS-KEY ("Pre-exposure prevention") OR TITLE-ABS-KEY ("HIV prevention medication*") OR TITLE-ABS-KEY ("Pre-exposure prophylactic treatment*")) AND (TITLE-ABS-KEY ("Sexual and Gender Minorit*") OR TITLE-ABS-KEY ("High-Risk Population*") OR TITLE-ABS-KEY ("Key population*") OR TITLE-ABS-KEY ("vulnerable group*") OR TITLE-ABS-KEY ("Vulnerable population*") OR TITLE-ABS-KEY ("At-risk group*") OR TITLE-ABS-KEY ("Men who have sex with men") OR TITLE-ABS-KEY (msm) OR TITLE-ABS-KEY ("Female sex worker*") OR TITLE-ABS-KEY (fsw) OR TITLE-ABS-KEY ("Injection drug user*") OR TITLE-ABS-KEY (idus) OR TITLE-ABS-KEY ("Injecting drug*") OR TITLE-ABS-KEY (transgender*) OR TITLE-ABS-KEY (incarcerat*) OR TITLE-ABS-KEY ("Migrant population*") OR TITLE-ABS-KEY ("Serodiscordant couple*") OR TITLE-ABS-KEY ("commercial sex*") OR TITLE-ABS-KEY ("transactional sex") OR TITLE-ABS-KEY ("unprotected sex*") OR TITLE-ABS-KEY ("multiple sexual partner*") OR TITLE-ABS-KEY ("high-risk behavi*")) AND (TITLE-ABS-KEY ("West Africa") OR TITLE-ABS-KEY ("Western Africa") OR TITLE-ABS-KEY ("West African region") OR TITLE-ABS-KEY ("West Africa Countr*")) OR (AFFIL (benin) OR AFFIL ("Burkina Faso") OR AFFIL ("Cape Verde") OR AFFIL ("Ivory Coast") OR AFFIL ("Côte d'Ivoire") OR AFFIL (gambia) OR AFFIL (ghana) OR AFFIL ("Guinea-Bissau") OR AFFIL (liberia) OR AFFIL (mali) OR AFFIL (mauritania) OR AFFIL (niger) OR AFFIL (nigeria) OR

	AFFIL (senegal) OR AFFIL ("Sierra Leone") OR AFFIL (togo) OR AFFIL (guinea)) AND PUBYEAR > 2012 AND PUBYEAR < 2024 AND (LIMIT-TO (LANGUAGE , "English")) AND (LIMIT-TO (DOCTYPE , "ar"))

Search String for ScienceDirect Database

ScienceDirect	Filters: Research articles, Years (2013-2023) ("Pre-Exposure Prophylaxis" OR PrEP) AND “West Africa”

Search String for Goggle Scholar Database

Goggle Scholar	Filters: Years (2013-2023), include patent, include citations "HIV Pre Exposure Prophylaxis" OR "HIV PrEP" "West Africa"

RESULTS

The search yielded a total of 1,111 articles. Explicitly, 71 records from PubMed, 70 from Scopus, 256 from ScienceDirect, and 714 from Google scholar. The articles were deduplicated and 1034 articles' title and abstract were initially screened for eligibility and eligible 152 articles' full text were further review and finally, 37 articles met the inclusion criteria and these were included in this scoping review *(see figure 1).*

STUDY DESIGN AND METHODS

Out of the 37 studies included in this review, 6 were qualitative.[32,37,38,57,62] 16 of the 37 studies were quantitative,[27,28,30,39,41,43,44-49,52,54,58,59] and 15 were of mixed methods combining both qualitative and quantitative methods for research and analyzing data.[25,26,29,31,33,34-36,40,50,51,53,55,56,60]

At-risk Groups

Of the 37 studies, 28 centered on only 1 high-risk population, the other 9 studies focused on more than one high-risk population at a time.

Most studies were derived from data collected from There has been few cohort studies conducted in the region focusing on MSM and FSW and most studies on PrEP further derived their data from these cohort studies hence the interest of most researchers have been skewed to these 2 high-risk populations and hence for this scoping review, 17 out of the 37 studies focused solely on MSM, [26,27,28,29,30,32,36,37,39,40,42,50,52,55,56,57,60] whilst 9 were solely on FSW. [25,33,34,41,44,45,47,48,58]

Only one study was on serodiscordant couples alone,[31] and 1on young adults alone[43] which met the inclusion criteria. There was however no study on PWID.

In all, 26 of the 37 studies had a focus on MSM-26 which was the majority.

STUDY CONCEPT

PrEP Awareness

12 of the 37 studies measured PrEP awareness among high-risk populations. Of these, 8, [30,34,36,38,41,43,46,57] reported low awareness rate whilst 4 reported high awareness amongst sample populations representing.[28,51,52,59]

PrEP Knowledge

Only 10 of the 37 studies reported on PrEP knowledge and of these, 2 reported a high knowledge of PrEP by participants.[38,52] 8 reported generally low knowledge of PrEP. [30,32,34,38,41,43,57,61]

Willingness and Acceptability to use PrEP

Of the 37 studies, 17 reported on willingness to take up PrEP,[28,30,32,34,35,36,38,39,41,42,44,46,47.51.52.53.57] and all these studies reported high willingness rate among key populations.

Actual use and uptake of PrEP

7 of the 37 studies reported on findings of actual PrEP use or PrEP uptake as compared to willingness to use PrEP. Of these 7, 3 studies reported that, actual use of PrEP was low,[41,43,49] and the other 4 reporting higher uptake rates among participants.[28,44,50,58]

Adherence to PrEP

On PrEP adherence, 11 studies reported findings of PrEP adherence as reported by their respective study participants. 3 studies reported that the high-risk populations had a high adherence rate,[40,50,60] and 8 reporting low adherence among study population.[25,27,28,33,44.45,47,58]1 other study

reported on PrEP adherence as measured by drug concentrations in the blood of participants as measured in the laboratory which was low.[48]

Retention on PrEP

Follow-up for retention of participants on PrEP was reported in 7 studies, and of these 5 studies reported low rates of retention, [25,26,28,49,58] whiles 2 reported high retention rates.[31,44]

FACILITATORS TO PREP UPTAKE, USE AND ADHERENCE

Individual Factors

Risk perception was reported as a facilitator in 8 studies.[26,36,37,38,44,46,50,56] which postulated that, people perceiving themselves to be at high risk for acquiring HIV would likely be interested and use PrEP. 2 studies also stated, that the perception that PrEP gives an extra level of protection as an add-on to using other traditional methods like condoms was what facilitated its uptake and use. [32,42] the use of condom in itself was also stated as a positive factor in 1 study,[30] further stating that, individuals consistently using condoms would likely use PrEP.

On the other hand, individuals wanting to have "condomless" sex,[38,50,53,54] the choice of having multiple sexual partners as well as having sex with friends with HIV without the fear of HIV acquisition all promoted the uptake of PrEP.[42]

2 studies,[53,54] also reported, child-bearing needs and avoiding marital and family issues related to negotiating condom use by a partner motivated the use of PrEP and 1 more stated that,[50] PrEP use enabled individuals to frequently have sex with one stable partner.

Per 1 study,[46] individuals who were HIV positive were more likely aware of PrEP and this is complimented by findings from 3 other studies,[41,43,56] which stated that at-risk populations who have at a point tested for HIV and other STIs would likely be aware of PrEP as there would have at a point received counseling and education during the testing process.

Findings from 8 studies were that, awareness and Knowledge about HIV and PrEP as well as Education in itself all factored positively in PrEP uptake and adherence,[30,35,37,41,46,52,53,56] with 1, [30] again reporting on, education and activities, that increased PrEP awareness being a positive factor. I study emphasized that, one facilitator to PrEP use was by healthcare workers improving knowledge of HIV and awareness on self-perceived risks among populations at high risk by disseminating information on PrEP.[37] In contrast, one study reported that, comparatively, being PrEP aware prior to information dissemination was a positive indicator to PrEP uptake compared to being PrEP unaware,[39] with one other stating that, those who already intended to use PrEP prior to information dissemination were likely to use PrEP.[48]

Concerning the socio-economic state of the individual, 3 studies reported on free and easy access, [30,38,52] one on effective costing,[32] and another on the absence of constraints as facilitators to PrEP uptake.[42] Also at-risk individuals with a high socio-economic status,[41] and living in cities and urban areas facilitated PrEP awareness and use. [41,46]

2 studies cited younger age to be a facilitator to PrEP use, [41,52] whereas 3 studies, in contrast cited older age to be a facilitator, [44,48,60] and reasons stated included for example, for FSW, older workers had partaken of more HIV prevention programs, and most older workers had relatively less customers giving them more time to visit clinics.

On the matter of drug properties, minimal side effects that users experienced or perceived to experience and also the efficacy of the drug were facilitators as per findings in 1 study.[32] Also, 2 studies stated that, the suitability of long-acting PrEP were facilitators,[33,37] whiles the safety profile of the drug,[42] as well as less frequent dosing as stated by 1 other were positive factors to PrEP uptake and use.[58]

Individuals with a high self-esteem were likely going to take up PrEP as reported by 2 studies, [39,41] and findings from 1 other stated that, individuals who perceived themselves as having control of adherence also were likely going to take up PrEP.[48]

Religious ties were reported on by 2 studies, 1 stating that all participants were Christians,[52] however, this finding bore no correlation to PrEP uptake and use and the other stating that, being a Muslim facilitated PrEP use among FSW in Ghana.[41]

Also, a study among MSM reported that, the population of interest were single unmarried men, however, this again was not correlated to PrEP use.[52] Nonetheless, this same study had reported that, a facilitator to PrEP uptake was being divorced or widowed.

2 studies reported that, educated individual and those with higher education positively affected PrEP uptake,[41,49,51] and health literacy also and of itself was facilitator per 1 other.[56]

For MSM, receptive and versatile sexual positions were associated with PrEP adherence with 1 other study stating that, being exclusively homosexual correlated highly with PrEP use.[52]

Lastly, 1 study also reported the use of psychoactive drug among high-risk populations being a positive indicator for PrEP use.[54]

Interpersonal Factors

Peer education was cited as a facilitator to PrEP uptake, its adherence and use in 5 of the studies,[26,36,37,50,51] with 1 study,[50] reporting that, when peer-education took place particularly outside of scheduled visits, it enhanced PrEP adherence.[50]

Also, identity networks for which at-risk populations belonged to, positively impacted PrEP uptake and use as reported by 4 studies of which 3 further cited that, when PrEP was made available in these networks it was associated positively with PrEP use, [28,52,58] with one further emphasizing that a facilitator in particular was affiliation with an MSM network.[28] The fourth study reported that what facilitated PrEP use among these networks was a larger network density.[49] Also, 1 study reported that using PrEP-refill groups and networks facilitated PrEP uptake.[58] and yet another cited that clinics led by peers facilitated PrEP uptake.[51] In contrast, a study on MSM reported that, in certain instances, being isolated this identity community rather motivated PrEP uptake.[56]

Seven (7) studies reported that social support facilitated PrEP use.[29,33,37,49,52,53,60] Social support was further detailed as perceived emotional support from partners and family,[50] community support in one study[33] enhanced support in another,[29] peer support by one .[37]

Still on interpersonal facilitators, 4 studies reported that one facilitator to PrEP uptake and motivated use was when MSM disclose their sexual preference and orientation to family and or community.[37,40,56,60] Also, a study cited that, when partners discussed HIV testing and prevention, they were likely going to show interest and take-up PrEP.[43]

For FSW,[54] and serodicordant couples,[53] 2 studies cited that, not being able to negotiate for condom use during sex in certain circumstances motivated these high-risk populations to show interest in PrEP uptake.

Environmental Factors

For environmental factors that facilitate PrEP uptake, 3 Studies among MSM noted of key, the provision of PrEP services in MSM-friendly community-based clinics [26,40,50] however and on the contrary, 2 studies opinionated that, incorporating PrEP services through general Out-Patient Department services for everyone improved the uptake of PrEP for those at high-risk.[31,51] Still on provision of PrEP services, a study revealed that, health centers that integrated entry of care services for both HIV positive and HIV-negative clients saw a better PrEP uptake,[34] with 3 other studies also citing that, PrEP being made available to a wider public would enhance uptake,[37,57,58] and 2 studies reporting that when PrEP is made available at all healthcare facilities and levels, covering a broader geographical areas, it would lower stigma associated with PrEP take up and improve its use.[57,58]

Also, 2 studies cited that, when a patient-centered approach is employed and services are tailored to address risky behaviors including alcohol and drug use, younger age and longer PrEP use, PrEP uptake was improved.[31,34] More so, regular follow-up of clients on PrEP,[34,36] having a positive relationship with healthcare personnel,[36] and specifically putting up measures and strategies to deliver PrEP which address stigma in healthcare settings,[37] and creating a safe, conducive and discrete environment for PrEP initiation and counselling,[60] were all enabling factors for uptake and use of PrEP as cited in those studies.

In 2 studies, adherence to event-driven PrEP was higher compared to that of daily PrEP,[28,56] whereas, 2 studies also cited preference for daily PrEP.[52,57] 2 other studies in contrast to all the above reported that when both event-driven and daily PrEP were offered, it improved uptake.[29,56]

Still on offering PrEP services, specific counselling on the difficulties of adherence as well as the risk of HIV infection with non-adherence as reported by a study,[29] counselling in general reported by 2 studies, one amongst serodiscordant couples,[31] and one in MSM,[60] enhanced adherence counselling reported by 1,[56] were all facilitators to PrEP uptake. One study also reported that campaigns and disseminating information were all good for PrEP adherence.[57]

Moreso, the use of mobile clinics to deliver PrEP services as reported by 2 studies, [33,34] and community outreaches,[37] all enhanced PrEP uptake.

For FSW, 1 study reported that unregistered sex workers were willing to take up PrEP as compared to registered sex workers.[44]

For government initiatives, PrEP availability correlated positively with uptake and use as reported by 1 study.[42] Also advertisements when using of location-based apps particularly among the MSM community increased awareness of PrEP.[46,59] Likewise, using electronic and print media as a means of creating PrEP awareness and educating on stigma enhanced its use.[53] Also, one other study reported that, incorporating PrEP programs into a more global preventive strategy that included counselling, screening for STI, promoting safe sex facilitated PrEP uptake and use.[57]

Considering legal and human rights approach, it was reported by a study amongst MSM that in certain countries, decriminalizing and ensuring that specific laws that penalized same-sex relationships became non-existent would promote PrEP uptake.[28]

One (1) study stated that, a shift from a risk-based approach for PrEP programs to a health promotion approach would facilitate its uptake.[37] Also, it was noted in 1 study that when PrEP services were offered through NGOs in comparison to healthcare settings, uptake was improved[57]

whilst lastly, 1more study compared adherence when PrEP services were offered by clinics to those offered through Community services and noted the former was higher.[60]

BARRIERS TO PREP UPTAKE, USE AND ADHERENCE

Individual Barriers

For FSW and MSM, constraints in time were reported to be an impedance to PrEP uptake in 1 study.[26] Socio-economic barriers that were outlined included unemployment as stated in 3 studies,[26,50,56] concerns of unstable housing and homelessness for high-risk populations by 3 studies,[36,50,56] financial vulnerabilities by 10 studies.[26,29,34,35,36,38,42,50,51,56]

In 3 studies difficulties in transportation because of distance between residence and point of PrEP uptake posed as a barrier to PrEP use.[34,35,50]

Also, a low education and literacy level as reported by 1 study,[36] low health literacy by 2 studies,[41,50] and in and of itself a low awareness, knowledge and use of PrEP as well as PrEP interventions were all identified as barriers.[41,42]

Competing demands such as out-of-station-work-related travel which leads to high mobility,[31] and high mobility in itself mainly by FSW, [25,33,44,51,58] and also by MSM and serodiscordant couples,[31] particularly to areas of low or no PrEP coverage were all cited as barriers to PrEP uptake in these 6 studies.

6 studies compared the 2 types of dosing regimen and they reported that, it was difficult to follow the event-driven PrEP regimen.[28,29,52,55,56,57] On the contrary, 3 studies that also compared both regimen cited that the daily regimen was difficult.[31,44,56] One study reported that daily PrEP had to

be taken for a longer duration and this served as a barrier for most individuals,[48] whilst another study among MSM cited that for the event-driven PrEP, the difficulty in planning for sex was a barrier,[29] and for both, a fear to adhere poorly to the regimen as well as dosing issues were identified as barriers.[38]

For inherent drug properties, individuals expressed concerns about drug resistance as identified by 3 studies, [30,38,53] drug side effects by 5,[30,31,34,38,51] misconceptions and false information misleading populations by 2,[37,51] and of note for FSW and women, concerns about the safety of baby during pregnancy whilst on PrEP,[44] were all cited as barriers to PrEP uptake and use.

Risky sexual behaviors particularly among MSM, transgender and gay people as identified in 1 study,[50] and alcohol use in 2 were barriers to the uptake and use of PrEP.[48,56]

For FSW and MSM, lower understanding of PrEP and not being able to well-adapt PrEP to their life context resulted in poor uptake, adherence and use,[33,50,56] and also in general at-risk groups having a low risk perception was a barrier to taking up PrEP, identified by 4 studies.[26,39,44,52] Individuals in the younger age range were in particular identified to perceive themselves at a lower risk of acquiring HIV which impeded their need to take up PrEP,[26,52] whilst on the other hand for FSW, workers who debuted at a latter age were identified to be less likely aware and hence use PrEP.[41]

For high-risk groups, the fear that PrEP use would result in risky sexual behavior and cause a sexual disinhibition was identified to be a barrier to why they would use PrEP per 5 studies,[38,48,51,52,57] and also that using PrEP might mean a migration from condom use as per 1 study,[48] which leads to a higher risk of STI acquisition as identified in 3 studies, [38,51,52] and the risk of unwanted Pregnancy in 1 study,[51] were all barriers to PrEP use and uptake.

Interpersonal Barriers

Of the 37 studies, 10 identified stigmata from parents, friends and partners, as a barrier to particularly daily PrEP uptake where the person on PrEP was perceived to be HIV-positive on ARVs.[28,34,36,37,38,39,51,53,55,56,57]

For sex workers, still on stigma, the perception of sex work and the stigma that comes with it becomes a barrier for FSW as identified by 1 study.[33]

Also, lack of support from partners,[31,36] society and family,[50] were all identified as barriers. In contrast to each other, one study reported that, having only casual partners was a barrier to PrEP uptake as a result of less risk perception,[50] whilst another stated the barrier to be a stable male partner .[56]

According to 2 studies, psychosocial barriers such as loneliness and depression impeded PrEP uptake and use.[26,46]

Lastly, in a study amongst serodiscordant couples in Nigeria, PrEP uptake was identified to be low in men with HIV positive partners as a result of social pressure to remarry or divorce their HIV positive partners.[31]

Environmental Barriers

Though it had been stated earlier that mobile clinic enhanced uptake and use of PrEP, issues arising from logistics such as bad roads which impeded access and faulty trucks served as a hindrance.[33]

In the healthcare setting, stigma meted out by staff,[26,33,34,38] lack of motivation of healthcare workers,[33] complicated processes to obtaining PrEP,[42] which includes several hospital visits

further worsened by inefficient care delivery by many public Health sectors,[51] were all cited as barriers to PrEP uptake.

For the manufactures of PrEP, taste and size of the meds,[42] cost,[26,34,35,38,42,51] shortages of PrEP,[38] its availability,[53] were cited as barriers.

Also, restrictive laws concerning Female sex work was stated as a barrier in 1 study.[34] More so, the lack of access to PrEP by NGOs in areas where NGOs were a key player to PrEP services turned out to be a barrier as cited in 1 study.[57] A lack of government commitment, monitoring systems or surveillance and policy guidance were stated as structural barriers in 1 study.[38]

Finally, one study among serodiscordant couples identified that, PrEP uptake was low for men whose wives were HIV-positive and enrolled in ARV programs, because for those male-dominated societies, it is culturally unexpected man to follow the pace of the woman.[53]

TABLE 3: STUDY CHARACTERISTICS

Study number	Author and year	Country of study	Study objectives	Study population and sample	Age group (years)	Study design and methods	Study characteristics
1	Mboup et. al., 2018	Benin	To assess the feasibility and usefulness of adding early-ART and PrEP to the combination prevention package, including clinical, behavioral and structural components, already offered to FSWs in Benin.	FSW n=361	>=18	mixed observational cohort study	1. HIV prevalence among FSW was high 2. Willingness to take up PrEP was high among HIV -negative FSW but not as high as willingness to take up ART among HIV positive FSW 3. Adherence and retention rates for PrEP was poor 4. Factors that affected retention included high mobility among FSW to areas of no PrEP coverage
2	Eubanks et. al, 2022	Burkina Faso, Togo, Mali, Ivory Coast	1. To estimate the proportion of participants Lost to follow-up (LTFU) in PrEP study and to identify the risk factors for this loss. 2. To identify barriers and facilitators influencing steps of the PrEP care cascade which would play a role in retention. 3. To explore risk factors for LTFU among MSM taking PrEP in West Africa	MSM n=647	>=18	Mixed Prospective cohort study	1. More than half of the study participants were lost to follow-up when put on PrEP equaling low retention rates 2. Peer education and Provision of PrEP in MSM-friendly community-based clinics were a positive factor to increase initiation, adherence and retention 3. Barriers to PrEP retention were vulnerability (hostile environment towards MSM), cost, time, unemployment 4. Psychosocial barriers include depression, financially insecure event driven use, loneliness and younger age 5. Risk perception also affected PrEP initiation and retention
3	Laurent et al, 2021	Burkina Faso,	To assess the uptake of event-driven and daily PrEP, HIV	MSM n=598	>=18	Quantitative	1. PrEP adherence was suboptimal

		Mali, Togo, Ivory Coast	incidence and changes over time in sexual behaviors and prevalence of bacterial sexually transmitted infections			Prospective cohort study	2.
4	Diabate et. al., 2023	Benin	To assess uptake, retention and adherence to PrEP, trends in consistent condom use and number of sexual partners, as well as HIV incidence and trends in the prevalence of gonorrhea and chlamydia during follow-up.	MSM n=204	>=18	Quantitative Prospective observational Cohort study	1. 80% of study population preferred daily PrEP 2. There was already in place an HIV preventive package in the catchment area which could have accounted for high participation rate 3. The study postulated a high awareness of PrEP among study population. 4. Availability of PrEP within Identity networks could have been a facilitator for use of PrEP 5. Identifying networks of such populations could help raise awareness of PrEP and hence play a key role in successful implementation in the face of stigma and discrimination 6. Event-driven PrEP intake showed a higher adherence to daily oral intake 7. Concerns of partners, parents and friends could have accounted for relatively poorer adherence to oral prep as it could be equated for HIV-Positive taken daily meds as compared to event-driven intake. 8. Adherence could have been better in this study as compared to other studies in other west African countries as a result of affiliations to MSM networks in Benin, as well

							as decriminalization and non-existence of specific laws penalizing same-sex relations. 9. There were low adherence rates despite good uptake and retention rates.
5	Laurent et. al., 2023	Ivory coast, Mali Togo, Burkina Faso	To document HIV seroconversion and associated determinants, PrEP adherence, plasma drug concentrations, and HIV drug resistance in MSM using event-driven or daily PrEP	MSM n=647	>=18	Mixed Prospective Cohort study	1. Incidence of HIV among participants on Event-driven PrEP was higher than those on daily PrEP mainly as a result of difficulty adhering to Event-driven regimen 2. Adherence was affected by financial constraints and difficulty planning for sex as a result of lower number of male sexual partners 3. Offering both event-driven and daily PrEP was important in increasing number of users 4. Information concerning adherence difficulties and risk of HIV infection if adherence if not maintained is important. 5. Enhanced support is needed to ensure adherence
6	Diabate et. al, 2021	Ivory Coast	To estimate PrEP acceptability and to identify key facilitators and barriers that could be addressed prior to its implementation among MSM in order to enhance uptake and adherence.	MSM n=201	>=18	Quantitative Cross-sectional study	1. Intention to use PrEP among the population was high 2. Factors that affected PrEP use were awareness and knowledge 3. Facilitators to PrEP use included free access to PrEP 4. Condom use was also a positive indicator of PrEP use 5. Awareness and knowledge of PrEP prior to study was low

							6. There is the need for PrEP-awareness activities and education 7. Fear of drug-resistance when a person on PrEP becomes HIV positive was a barrier to PrEP use 8. Concerns about drug side effects was also a barrier to PrEP use
7	Folayan et. al, 2022	Nigeria	To evaluate the effectiveness of three models for service delivery as part of a combination HIV prevention strategy.	Heterosexual serodiscordant couples n=297	>=18	Mixed methods Cohort demonstration study	1. PrEP services provided through general OPD services showed higher retention rate compared to those provided through special clinics that also provided ART services and this was attributed to stigma 2. HIV-uninfected partners were less likely to adhere to PrEP compared to HIV-positive partners taking ART as positive partners offered less partner support to negative ones 3. Partner support could not be verified as a factor for PrEP adherence though other studies show that it is a positive factor of ART treatment 4. Factors that impeded PrEP adherence included drug side effects and difficulty with taking drugs daily, competing demands, such as out-of-station work-related travel, which caused missed clinic visits. 5. Factors that could enhance PrEP adherence included PrEP adherence counselling, and tailored services to address individual needs, risky

							sexual behaviour, alcohol use, younger age, and longer PrEP use duration
8	Ogubanjo et. al, 2020	Ghana	Explores knowledge and acceptability of HIV PrEP among Ghanaian MSM	MSM n=317	>=18	Qualitative Descriptive study using focused group discussion	1. There was generally low knowledge of PrEP 2. There was high acceptability following introduction to PrEP 3. Positive factors to acceptability were the perception of extra level of protection that PrEP had to offer including efficiency, minimal side effects and cost effectiveness.
9	Becquet et. al, 2021	Ivory Coast	To develop, document, and analyze a community-based healthcare package that combines testing and prevention tools, including PrEP, immediate HIV treatment, the management of HBV, and Sexual and Reproductive Health.	FSW n=500	>=18	Mixed Interventional cohort Study	1. Challenges to PrEP include high mobility of participants to different prostitution sites and different parts of the country, the motivation of healthcare workers, the relationship with the sex work community and its perceptions of the program, the logistics of the mobile clinic (road conditions, truck breakdowns) 2. Adherence to PrEP has been relatively low. 3. Barriers to PrEP uptake include poor adaptation to FSWs' life context, mobility of FSWs and the stigmatization they face from their neighborhood or healthcare professionals. 4. Facilitators on the other hand include community support and mobile clinics to all prostitution sites and the suitability of long-acting PrEP.

10	Becquet et. al., 2020	Ivory Coast	To describe the work and social environment of FSWs, their SRH needs, and possible barriers to accessing care in two different settings in Côte d'Ivoire, that is, different elements that need to be taken into account when implementing PrEP	FSW n=100	>=18	Mixed Cross-sectional study	1. There was low awareness and knowledge of PrEP prior to study 2. There was high level of willingness to use PrEP after introduction of project despite the constraints of follow-up. 3. Barriers to PrEP use included drug side effects and timing of daily pill 4. For FSW, barriers to accessing SRH for which PrEP is included includes the high costs, distance from sites, stigmatizing and discriminating attitudes of some health professionals, the social and economic marginalization, and restrictive laws related to their activity 5. There was more focus on HIV-positive FSW and access to treatment care than HIV-negative ones and preventive care 6. A patient-centered approach where PrEP is part of SRH would best suit the needs of FSW 7. Introduction of mobile clinics that deliver HIV and SRH care services directly at prostitution sites could mitigate the issue of FSWs' mobility and address barriers to access to care, such as distance between prostitution sites and clinics or stigmatization associated with their activity 8. In order to minimize stigma related to entry into

							care, services for HIV-positive and HIV-negative should not be dissociated 9. Regular follow-up is needed for PrEP programs
11	Durrosinmi-Etti et. al, 2022	Nigeria	To determine the proportion of Key Population groups who are willing to pay for HIV prevention commodities, the median amount the Key Populations groups are willing to pay for each commodity, factors that affected willingness to pay for each commodity, and recommended strategies for improved and sustainable HIV prevention programming in Nigeria.	FSW MSM PWID n=1169	>=18	Mixed Cross-sectional survey	1. Participants were willing to pay for PrEP 2. Factors affecting PrEP purchase and hence use was the cost 3. Place of residence and awareness of PrEP also affected how much key populace was willing to pay for PrEP
12	Eubanks et. al., 2020	Mali Ivory Coast Burkina Faso Togo	To determine whether the introduction of PrEP as an additional prevention tool influenced the type of participant signing up for CohMSM-PrEP	MSM n=524	>=18	Mixed Prospective Cohort Study	1. Poor socio-economic status which includes financial instability, homelessness, poor literacy and low education level was a barrier to PrEP uptake. 2. Psychosocial factors that affect PrEP discontinuation included lack of partner support as well as stigma associated with taking PrEP being perceived as HIV-positive 3. For new participants, positive relationship with healthcare staff with follow-up is needed for PrEP program 4. MSM who declare or are aware of their high-risk sexual behaviors were likely to take PrEP 5. Prior to study, there was low level of awareness on PrEP, but willingness to take up PrEP increased after education

							6. Peer education interventions was a positive factor to PrEP uptake
13	Reyniers et. al, 2023	Mali Togo Ivory Coast Burkina	To explore the perceptions of West African MSM toward PrEP and their proposed strategies to overcome barriers to PrEP uptake within their communities	MSM n=161	>=18	Qualitative Descriptive study Semi-structured interviews and focused group discussion	1. According to participants, important strategies for increasing PrEP uptake in West African MSM communities are improving HIV knowledge and self-perceived risk of HIV through increased awareness-raising, increased dissemination of PrEP information, preferably via peers and healthcare professionals, and implementing strategies or tailoring PrEP delivery to avoid potential stigmatization. 2. Stimulating peer communication and supporting PrEP users in actively disclosing their PrEP status to other community members can be important strategies for increasing its uptake 3. Community outreach may be crucial to increasing the uptake of HIV prevention services such as PrEP and HIV testing among those not-yet-reached by local clinics or gay community organizations 4. A major barrier for oral PrEP uptake in West African MSM communities in the study was anticipated stigma due to its associations with homosexuality and HIV 5. Factors to improve PrEP uptake include to

							normalize PrEP by making it available to the wider public and to underscore its protective effect. 6. Also, a shift from a risk-based narrative toward a health-promotion approach may help increase PrEP demand 7. Novel long-acting HIV prevention tools such as injectable PrEP may be promising as they are more discrete and could reduce the risk of stigmatization upon involuntary disclosure of their sexual orientation 8. Misconceptions and false information regarding HIV and PrEP, combined with the suggested fears of stigmatization, discrimination, and social rejection when taking PrEP, also point to the difficulties for HIV and community organizations to address these matters `in West African MSM communities
14	Gyamerah et. al, 2023	Ghana	To examine PrEP knowledge and acceptability, and barriers and facilitators to its uptake and implementation	MSM, trans women and GDSM n=50	>=18	Qualitative Descriptive semi-structured Interviews	1. PrEP awareness was low among key population prior to study 2. Willingness to use PrEP was heightened following PrEP study 3. Stigma and anti-gay views both in and out of hospital settings and association of being gay with HIV were a major barrier to PrEP uptake and yet a core of the interest of key groups in PrEP use

							4. Service providers were knowledgeable about PrEP but key populations showed less knowledge 5. Risk perception is a motivating factor to PrEP uptake 6. The need to have more intimate and pleasurable condomless sex was a key factor in uptake of PrEP among MSM 7. Barriers and facilitators of PrEP implementation raised ranged from medical concerns (e.g., STIs; drug resistance); social behavioral concerns (e.g., stigma, risk compensation, adherence issues); and structural barriers (e.g., cost/affordability, government commitment, monitoring systems, policy guidance) 8. Making PrEP free or affordable was a positive factor to PrEP uptake 9. Accessibility and ease of PrEP use i.e., pill dosing and fear of side effects and health risks such as pill fatigue also affected PrEP use 10. Health system challenges such as the country's weak monitoring/surveillance system that may affect provider's ability to monitor PrEP enrollment and outcomes, as well as concerns about potential PrEP shortages due to a history of antiretroviral shortages in Ghana

							11. Feared antiretroviral resistance among clients after seroconversion or due to poor adherence to PrEP, and risk compensation resulting in STI infections were all counted as barriers to PrEP use.
15	Coulaud et al., 2018	Cote d'Ivoire Togo Mali Burkina Faso	To explore the interest in taking PrEP among Western African men who have sex with men	MSM n=564	>=18	Quantitative Cross-sectional survey	1. Majority of participants were interested in taking PrEP 2. Those unaware of PrEP were more interested in taking PrEP than those who were aware 3. Participants who perceived themselves being at a lower-risk of HIV acquisition, by identifying as being more attracted sexually to women than men were less interested in PrEP than otherwise 4. Participants with high-level of self-esteem were likely interested in PrEP than otherwise which could be attributed to the reflection in their sexual behaviors.
16	Adeyemi et. al, 2023	Nigeria	To estimate the correlation between self-reported PrEP adherence and PrEP biomarkers and explore factors associated with adherence among men who have sex with men in Nigeria	MSM n=219	>=18	Mixed Prospective Cohort study	1. PrEP adherence was higher among participants introduced to PrEP in the clinics compared with communities and those with same-sex practices family disclosure
17	Guure et. al, 2022	Ghana	To investigate the prevalence and correlates of PrEP of FSW willingness and its use among this high-risk population in Ghana	FSW n=5107	>=16	Quantitative Integrated bio-behavioural survey	1. Approximately half of the respondents were willing to take PrEP with majority being concentrated in the cities where awareness and intervention programs were observed 2. There was low awareness and knowledge and usage

							of PrEP among the study population which were barriers to PrEP intervention 3. Those who were aware were likewise concentrated in cities 4. Willingness to use PrEP was high generally 5. Willingness to use PrEP varied across cities with areas of high socio-economic status being more willing to use PrEP 6. Age was a factor as younger participants ones were more willing to use PrEP attributed to more awareness among this cohort, higher educational status and also higher value placed on life 7. Later age of debuting sex work was a negative predictor to using PrEP 8. Knowledge and previous screening for STI was appositive Predictor of PrEP use as it created awareness 9. Muslims were more likely to use PrEP likely as a result of the more conservative nature of Islam hence the need for this group to avoid being exposed by an HIV infection which would result in stigma and discrimination
18	Ahouada et. al., 2020	Benin	To describe PrEP knowledge and intention to use it; identify key facilitators and barriers to PrEP; and describe the perceived impact of PrEP on unsafe sexual behavior	MSM n=30	>=18	Qualitative Descriptive studies with focused group discussions	1. All participants expressed intentions to use PrEP when made available 2. Facilitators to PrEP use included availability of medication, safety,

							absence of constraints as well as freedom to have multiple sex partners and sex with HIV-positive friends 3. Barriers included complex procedures for obtaining medication, size and taste of medication, cost of medication and poor PrEP awareness
19	Ajayi et. al, 2018	Nigeria	To examine the level of awareness and use of PrEP and PEP among Nigerian youth and also to determine the correlates of awareness of these preventive measures.	Young adults (university students) n=800	Age varied with the average being 24years	Quantitative Cross-sectional Survey	1. There was generally low PrEP awareness, knowledge and in effect PrEP use among study population 2. The sample of population who had at a point tested for and also discussed HIV with partners had a relatively higher awareness rate
20	Saar et. al., 2020	Senegal	to demonstrate the feasibility of providing daily oral PrEP with FTC/TDF for 12 months to FSWs at MoH-run clinics in Senegal, assessing uptake, retention in care, and adherence over up to 12 months of follow-up as well as HIV infection rates	FSW n=324	>=18	Quantitative Prospective Cohort	1. There was high interest, uptake and retention rates among the cohort 2. Unregistered sex workers showed higher interest in enrolling unto PrEP programs than registered workers 3. Older age was a positive predictor to PrEP uptake likely due to more experience with prevention programs and relatively less customers hence more time to visit clinics 4. Barriers to PrEP uptake were high mobility rates and pregnancy as a result of safety concerns to baby 5. Adherence rates were only moderate 6. Factors affecting adherence included risk-

							perception and also mobility
21	Mboup et. al, 2020	Benin	To measure adherence to PrEP and compare self-report and pill count adherence to tenofovir (TFV) disoproxil fumarate (TDF) concentration in plasma to determine if these 2 measures are reliable and correlate well with biological adherence measurements	FSW n=255	>=18	Quantitative Prospective Demonstration Studies	1. Adherence was low with further decrease with time
22	Ogubanjo et. al, 2019	Nigeria	To explore the relationship between socio-demographic, sexual risk behavior, and psychosocial factors with PrEP awareness, willingness to use PrEP, and history of PrEP use for HIV prevention among Nigerian GBMSM.	MSM, Gay, Bisexual n=419	>=18	Quantitative Interview-administered survey	1. PrEP awareness among study population was low prior to study 2. Willingness to use PrEP was higher after study 3. Residing in bigger cities was a positive predictor of PrEP awareness most likely due to PrEP availability in these states 4. Being HIV positive was also a positive predictor of awareness as a result of likely counselling on PrEP for serodiscordant couples during HIV testing 5. Use of location-based apps was a positive predictor for PrEP awareness as a result of advertisement on such platforms 6. Psychosocial health issues such as depressive symptoms were a negative predictor of PrEP use 7. Greater number of sexual partners translating to high-risk behaviours coupled with PrEP awareness positively impacted PrEP use.
23	Giguere et, al, 2019	Benin	To assess potential risk compensation by evaluating trends in unprotected sex for FSW on PrEP	FSW n-256	>=18	Quantitative Prospective cohort study	1. There was low adherence to PrEP despite the perceived benefits

24	Mboup et. al., 2021	Benin	To assess demographic and behavioral factors associated with optimal PrEP adherence among female sex workers participating in a demonstration project in Cotonou, Benin	FSW n=256	>=18	Quantitative Prospective demonstration study	1. Older age of at-risk population positively affected PrEP adherence 2. The longer the duration, the less likely it was for at-risk group to adhere to PrEP 3. Despite concerns raised by users on PrEP use having to cause increased risky behavior and impede condom use, this was not correlated with findings in the study 4. There was no correlation with PrEP adherence and alcohol use 5. Intention to use PrEP at baseline correlated positively to adherence 6. Perception of control of being adherent to PrEP positively affected intention to use PrEP which in effect affected PrEP adherence 7. Adherence as measured by drug concentrations of PrEP was low
25	Ramadhani et. al, 2023	Nigeria	To evaluate the characteristics associated with engagement in 7 steps of the PrEP cascade among SGMs in Nigeria.	Sexual and Gender minorities n=788	>=18	Quantitative Prospective Cohort studies	1. Interest in PrEP initiation was high 2. There was a major gap between willingness to use PrEP and actual PrEP use as majority were lost to follow-up and some did not adhere to the drug use 3. Facilitators to PrEP use were noted to be better social support, larger network density, and higher education
26	Eubanks et. al, 2022	Mali Burkina Faso	To estimate PrEP use and correct adherence rates in CohMSM-PrEP, together with associated factors over time	MSM n=520	>=18	Mixed Prospective Cohort Study	1. Self-report on PrEP use and adherence was high 2. Both PrEP use and adherence were linked to

		Ivory Coast Togo					cohort-related characteristics and participant's sexual behaviors 3. PrEP adherence was also related to social and economic vulnerabilities. 4. Attending MSM friendly clinics was positively associated with PrEP use hence provision of comprehensive prevention services in MSM-friendly sexual health clinics promote PrEP use 5. Contacting Peer Educator(s) outside of scheduled visit was associated with PrEP adherence hence Peer education facilitates correct adherence 6. High risk sexual behaviors correlated positively to PrEP use and adherence i.e., frequent sex with stable partners and having condomless anal sex were both associated high PrEP use whiles Receptive and versatile sexual positions was associated with correct PrEP adherence 7. PrEP users had more stable than casual partners hence found it easier to incorporate PrEP into daily routines 8. Lack of social and family support impeded PrEP adherence 9. Socio-economic strain impeded event driven PrEP adherence 10. Structural socioeconomic barriers including unstable

							housing, low income, unemployment, and transport problems, are all associated with low PrEP adherence and/or discontinuation. These structural factors directly influenced individual health literacy and in turn participants' ability to understand and adapt to the event-driven PrEP regimen.
27	Emmanuel et. al, 2020	Nigeria	To identify perspectives of MSM, FSW and policy makers on the needs for, barriers to, and challenges with pre-exposure HIV prophylaxis (PrEP); and the logistics required to support roll-out of PrEP for MSM and FSW in Nigeria	MSM, FSW, Transgender n=805	>=18	Mixed Cross-sectional study	1. A higher number of the population are aware and interested in PrEP 2. Barriers to PrEP use includes stigma as use of ART equates being HIV positive, labelling PrEP products as for persons at substantial risk of HIV who are promiscuous, gay or prostitutes 3. Increase in risk of unwanted pregnancy and sexually transmitted infection were also concerns expressed about PrEP. 4. Challenges to a wider use of PrEP may be the numerous scheduled hospital visits required, inefficient delivery of care in public health facilities, and the high mobility of FSW 5. Existing systems and structures, such as peer educators and peer-led clinics accessible to MSM and FSW, could serve as facilitators to PrEP use in increasing awareness, addressing

							misconceptions, and facilitating access of MSM and FSW to PrEP 6. Incorporating PrEP services into routine clinical care through general OPD clinics, and Peer-led services would promote PrEP use and adherence 7. Cost of PrEP was also noted to be a barrier to PrEP access and use 8. Other concerns that could serve as barriers to PrEP use included behaviour disinhibition; increased risk for pregnancy, sexually transmitted infections and toxicity of the medication.
28	Ahouada et. al, 2020	Benin	To assess PrEP knowledge and acceptability, to identify socio-demographic and behavioral variables associated with these two outcomes, as well as facilitators and barriers, associated with its acceptability.	MSM n=400	>=18	Quantitative Cross-sectional Survey	1. Most respondents were young adults, Christians, single people with a good level of education, most of them exclusively homosexual 2. Daily PrEP was preferred to Event driven PrEP by most 3. About half of the sample were aware and had knowledge of PrEP which was relatively high compared to other studies. However, majority were willing to accept and use PrEP after they were educated on it when translated to acceptability 4. Most of the respondents noted that their HIV-risk was not high 5. Young adults, divorced or widowed respondents were more likely to use PrEP

							6. Facilitators to PrEP included not having to pay for PrEP, access to individual support and support around the use of PrEP, and drug availability within the MSM networks 7. Barriers to PrEP use included its association with risky sexual behaviours that puts the individual at high risk of HIV
29	Idoko et. al, 2015	Nigeria	To explore public opinions on PrEP including community interest and perceptions its use as part of the HIV-prevention armamentarium in Nigeria.	Serodiscordant couples, MSM, Healthcare workers, PWID, PLWHIV, Reps from NGOs and CSOs which worked on HIV n=?	>=18	Mixed methods Exploratory descriptive design	1. There is high public interest and support for use of PrEP 2. The respondents prioritized HIV serodiscordant couples for PrEP access for reasons including the challenges faced by couples in continual condom use, the increased prospect for procreation, and the enhanced ability to reduce marital discord. 3. Challenges were identified for PrEP use and access including the potential for stigma associated with ARV use and the increased likelihood of index partners being women, as most serodiscordant couples are identified through screening for HIV infection in women attending antenatal clinics. For a male dominated society such as Nigeria, this has significant implications for the uptake and use of PrEP by HIV-negative male partners in

							serodiscordant relationships. 4. Education on PrEP could help enhance and facilitate PrEP use 5. Cultural expectations that define male-female relationships also impedes covert use of PrEP by women 6. Barriers to PrEP use included concerns raised about resistance resulting from drug unavailability and nonadherence to therapy 7. Electronic and print media were identified as important means for massive public education to prevent stigma and create awareness about PrEP.
30	Ochonye et. al, 2019	Nigeria	To determine and compare the sexual behavior and HIV sexual risk profiles of FSW, MSM and PWID; and identify factors associated with recent condom use among the groups, with the aim of providing evidence to strengthen HIV interventions for FSW, MSM and PWID in Nigeria	MSM PWID FSW n=488	>=18	Quantitative Cross-sectional survey	Facilitators to PrEP use include 1. Higher desire for condomless sex 2. Inability to negotiate for sex with condoms 3. The use of psychoactive drugs
31	Stromdahl et. al, 2019	Nigeria	To describe the human rights context for MSM in Abuja and characterize factors associated with having had a genital ulcer disease in the previous 12 months, a health outcome associated with increased risk of HIV acquisition and transmission.	MSM n=297	>=18	Mixed Structured Survey Interviews	1. Stigma remains a barrier to assessing PrEP
32	Eubanks et. al, 2022	Mali Togo Ivory Coat	To investigate the rate and predictors of ineffective HIV protection (i.e., incorrect PrEP	MSM n=632	>=18	Mixed methods Prospective Cohort Study	1. Socio-economic strain was a barrier to PrEP adherence and continuation in event-driven PrEP users and

		Burkina Faso	adherence and no condom use) in the CohMSM-PrEP study				included unstable housing, low income, unemployment. 2. Event-driven PrEP users were less likely to be adherent compared to daily PrEP users 3. Socio-economic determinants impacted negatively on health literacy. 4. Health literacy corresponded positively to PrEP use for event-driven users who found the daily regimen and adherence scheme difficult to understand 5. Factors to promote health literacy and in effect PrEP use included screening of vulnerable population, offering enhanced adherence counseling, offering both daily and event-driven PrEP to users as complimentary to each other to help users adapt to lifestyle at points in time 6. Alcohol misuse also negatively affected PrEP use and adherence 7. Isolation from MSM community and "coming-out" to family and friends positively impacted PrEP use as they reduced stigma and impact on knowledge availability and PrEP awareness and support 8. Having a stable male partner negatively predicted PrEP use and adherence

							9. High risk behaviors positively impacted on PrEP uptake and adherence 10. Event driven PrEP was preferred to daily regimen
33	Pelletier et. al., 2019	Ivory Coast	To assess the acceptability of PrEP among MSM in Bouake, Cote d'Ivoire	MSM n=31	>=18	Qualitative Cross sectional studies	1. There is a high level of PrEP acceptability among the cohort 2. There was high interest in PrEP 3. Most participants preferred the daily regimen to the on-demand regimen 4. Though there was interest, there was limited knowledge about PrEP prior to this study 5. There was low PrEP awareness 6. Information campaigns were good avenue for PrEP awareness 7. Risk compensation was a barrier to effective PrEP use 8. An integrated PrEP use program into a global prevention program including counselling, STI screening, Safe sex promotion would be beneficial 9. Most participants preferred to get their PrEP source from an NGO with healthcare arm dedicated to MSM 10. Stigma as well as accessibility of these health care arms provided by NGOs were a barrier to PrEP access 11. Provision of PrEP services in every Healthcare facility could positively impact PrEP accessibility

							12. Broadening PrEP access to all high-risk individuals (and not targeting only MSM) might be a way to mitigate the stigma surrounding PrEP
34	Mboup et. al, 2018	Benin	To assess the feasibility and usefulness of adding E-ART (immediate "test-and-treat") and PrEP to the combination prevention package, including clinical, behavioural and structural components, already offered to FSWs in Benin. .	FSW n=442	>=18	Quantitative Prospective Cohort study	1. Uptake of PrEP and Early ART were high but the latter was higher than the former 2. retention rates were lower for both PrEP and Early ART 3. PrEP adherence was poor and decreased even more with time 4. PrEP users lost to follow-Up resulted in sero-conversions implying that, PrEP adherence was key in high-risk situations 5. PrEP adherence should be considered at levels of high risk among populations to be more effective 6. High mobility which did not guarantee continuous access to PrEP was a barrier to PrEP retention 7. Retention issues could be minimized with broad geographical coverage of E-ART and PrEP programs in West African countries. Other options include allowing those on stable treatment to collect drugs less frequently or considering medication refill groups to ease drug collection by making such collection possible through peers.

							8. Condom migration was not a factor for PrEP use or adherence
35	Ogubanjo et. al, 2021	Nigeria	To characterize the frequency of Geosocial Networking apps usage and its association with sociodemographic characteristics, sexual health, healthcare access, psychosocial problems, and substance use in a large multicity sample of community-recruited GBMSM in Nigeria	Gay, Bisexual, MSM n=406	>=18	Quantitative survey	1. Population who used GSN apps were likely more aware of PrEP than those who were not 2. GSN apps could be a facilitator to PrEP advertisement hence creating awareness
36	Adeyemi et. al, 2021	Nigeria	To estimate the correlation between self-reported PrEP adherence and PrEP biomarkers, to assess the association between perceived social support with protective PrEP adherence, and to estimate the effect of PrEP use on behavioral outcomes	MSM n=400	>=18	Mixed Prospective cohort study	1. Perceived emotional and social support is a facilitator to PrEP adherence 2. The approach to introducing PrEP that is in a safer, more discreet space and more conducive environment for PrEP introduction counselling as compared to the counselling done within the community and disclosure of sexual orientation to family members were facilitators to PrEP adherence 3. Older age was associated with PrEP adherence 4. Clinic recruited participants were more adherent than community based recruited participants as they had more time in counselling before recruitment so were more adherent 5. PrEP adherence increased with time spent in study likely as a result of time needed to get used to the drug

37	Sabin et. al, 2018	Ghana	To increase understanding of HIV knowledge and vulnerability among adolescents and young adult MSM with a focus on alcohol and drug use and transactional sex	Young MSM, Male adolescents n=99	15-17 18-29	Qualitative Focused group discussions and interviews	Most participants had little knowledge of HIV PrEP

DISCUSSION

This scoping review, to the best of our knowledge, is the first in West Africa which examines awareness, knowledge, facilitators, and barriers to PrEP use among at-risk populations. Even though various individual studies were done to identify barriers and facilitators to PrEP usage in this region, this study aimed to draw out similar and distinctive trends not just among the various key populations but also across different countries in the region.

This review highlights the lack of data on this subject in West Africa when compared to other regions of Africa such as Southern and Eastern Africa.[13,15] The data in this review was focused on research conducted in only half of the 16 countries in West Africa. This necessitates further research in the area due to the high HIV prevalence rates of most countries in this region.[62]

Even though current studies published between 2013 and 2023 were set to be eligible for this study, it was observed that majority of the studies included in this review were more recent, mostly conducted after 2017. It may be that PrEP is a relatively new method of prevention. Additionally, Truvada received approval in 2012, and most of the research on its effectiveness, knowledge, and utilization took place post that time.[63]

KNOWLEDGE AND AWARENESS OF PREP

The result shows that awareness and knowledge of PrEP among at-risk populations in West Africa is generally low. In a multi-country qualitative study conducted in Burkina Faso, Mali, Togo, and Cote d'Ivoire, findings showed that just 28% of participants were aware of PrEP.[37] Yet, awareness of PrEP differs between countries due to varying economic statuses and supportive policies.[64] PrEP is increasingly becoming more familiar to at risk populations in developed countries like the US and European countries, where pilot studies and PrEP projects such as the iPrEx OLE and the PrEP

Impact Trials have been undertaken.[65] However, a recent study showed that there are high levels of awareness among high-risk populations in countries within Southern and Eastern Africa.[64] This perhaps could be that most PrEP initiatives were being implemented or focused on the southern and Eastern regions in Africa, where there is a high prevalence of HIV, leading to increased knowledge and awareness.[38,64] PrEP projects, including CohMSM PrEP studies and Demonstration Projects for MSM and FSW, are currently being championed in West African countries.[15,37] However, additional efforts are necessary to expand outreach to high-risk populations and the general public in order to raise awareness and knowledge of PrEP.

The findings of this study indicate that most research was carried out on urban populations and individuals who were 18 years and above. This aligns with PrEP demonstration and intervention efforts that focused on evaluating PrEP effectiveness and promoting PrEP knowledge and access primarily in urban areas with higher accessibility to key populations, compared to rural or remote areas.[41,46] Additionally, individuals who are 18 years and above are of legal age in most West African countries for sexual and reproductive health initiatives and projects.[41] Furthermore, it is challenging to access key populations in rural areas because of limited resources and conservative beliefs among rural residents towards sex work and gender diverse minorities.[41,46] This variation in knowledge and awareness levels related to geographical location has been documented in western countries, such as cities in the US.[66] In sub-Saharan Africa, research findings vary regarding awareness levels: one study in Nigeria found higher awareness among urban residents, [46] while another study found higher awareness among rural residents.[64] Therefore, more research is needed to fully investigate the reasons for this discrepancy in geographical distribution.

FACILITATORS AND BARRIERS OF PREP USE

Results from this research show that the uptake and use of PrEP is influenced by multiple factors that either facilitate or hinder its implementation. It indeed found numerous facilitating factors that influence the uptake and use of PrEP, and confirmed that PrEP users faced multiple obstacles to using PrEP. Recognizing the facilitators and barriers in this prevention method is crucial for developing successful healthcare strategies and programs to improve PrEP acceptance and utilization. These facilitators and barriers are also examined at the intrapersonal, interpersonal, environmental and institutional levels according to the socio-ecological model.[24]

Facilitators of PrEP Uptake and Use

At the intrapersonal level, Individual facilitating factors could be modified by the same person at different points in time. For instance, if at-risk populations believed they were more likely to get HIV, they would be more likely to use PrEP if made available.[20] This aligns with the finding from a systematic review conducted among MSM in low- and middle-income countries on PrEP awareness and uptake.[67] Additionally, with the extra level of protection provided by PrEP in addition to other usual HIV prevention methods like condoms use, key populations may feel more freedom in engaging in sexual activity with multiple partners. This highlights the necessity of educational initiatives to raise awareness among key populations in the region about their vulnerability to HIV and the advantages of using PrEP as a highly effective HIV prevention method.[37] The importance of PrEP education and interventions is emphasized by the fact that individuals at risk, who have undergone STI and HIV testing or health screenings, are more likely to use PrEP due to the education and counseling they receive during these screenings.

Some studies reported that using condoms could encourage PrEP use,[30,32,42] while the desire for pleasurable condomless sex was also identified as a facilitating factor to PrEP usage.[38,50,53,54] Individuals who reported to have been using condom were found to have a higher level of

awareness about PrEP, indicating a link between knowledge of safe sex practices and knowledge of PrEP.[46,64] Individuals who use condoms may have obtained information about safe sex practices from credible sources like healthcare facilities and may already possess a strong understanding of HIV prevention methods, which can make them more open to information about PrEP.[64] These perceptions highlight the importance of customizing PrEP to suit individual lifestyles and integrating PrEP information into a broad sexual health education and outreach program.

Furthermore, individuals at risk of HIV who had minimal side effects and believed the drug was effective were not only willing to start PrEP but also are likely to follow the treatment consistently and retained on it. A similar finding was also reported in a study among MSM in Rwanda .[64] This underscores the importance of public health education and awareness efforts that stress the benefits and effectiveness of PrEP in HIV prevention, as well as the safety of the drugs involved. It is also important to require pharmaceutical companies to consistently produce medications that are easier to tolerate, have fewer side effects, and are user-friendly.[5]

Additional facilitator that supports the use of PrEP among key populations include strong self-esteem, high education, high socio-economic status, and health literacy[39,41,49,51,56]. Individuals with advanced levels of education may at one point in time have heard of PrEP. More so, people with high socio-economic status and better health literacy are more likely to possess high self-esteem, influencing their sense of control over not just the use of PrEP, but other preventative measures, and the risk of acquiring HIV.[64]

With regard to the interpersonal facilitating factors that helped with PrEP use among key populations, it was found that peer education and peer-led clinics were especially effective in generating interest in PrEP use. If key populations are informed or taught about preventive measures by individuals from their own high-risk communities, especially if these individuals are

using PrEP and can vouch for its advantages, the key populations are more likely to trust the method and begin using PrEP. Furthermore, it was found that sharing PrEP information through peers was considered a valuable strategy to increase awareness among the population.[37] Moreover, those who associate with and recognize themselves as part of networks of vulnerable populations may feel comfortable talking about PrEP and other HIV prevention strategies. These individuals might also find it effortless to feel supported when choosing to use PrEP, especially if their peers approve of it. Social support that motivates key populations to use PrEP goes beyond just peers - it also encompasses support from partners, community, and family. This finding was reported in a study on PrEP-use disclosure which suggested that assisting PrEP users in openly sharing their PrEP status with others in the community can help boost PrEP use.[68] However, being affiliated with these groups could result in sharing personal information with family, friends or even untrustworthy people, potentially causing social stigma in the community and healthcare environments that may hinder access to PrEP services. This implores the necessity to investigate the specific instances in which being associated or not could have positive or negative effects on guiding personal decision-making.

Regarding environmental facilitators, some research stated that making PrEP available in MSM-friendly community-based clinics boosted PrEP usage,[26,40,50] while other studies reported that integrating PrEP services into general outpatient services and offering them as part of a comprehensive care package for high-risk populations also increased PrEP uptake. [3,69,70] Other study also found that combining care services for HIV positive and negative individuals at healthcare facilities and making PrEP accessible to the general population, rather than just key groups, at all levels of healthcare could eliminate the stigma associated with using PrEP among at-risk populations [37](Reyniers et. al., 2023). This just goes to the show that, services should be

tailored to meet specific needs of every population based on their jurisdiction and their social demands to ensure wider coverage which could increase the use of PrEP and reduce stigma.

Providing PrEP services in healthcare settings requires a patient-centered approach, addressing individual needs like risky behaviors, alcohol use, younger age, adherence difficulties, and positive relationships with healthcare workers.[3,69,70] Tailoring services, avoiding stigma, and creating a safe and discrete space for PrEP initiation and counseling are important factors for enhancing PrEP uptake and reducing stigma.[3,69]

Moreover, it was found that the use of mobile clinics and community outreaches to provide PrEP services increased PrEP uptake in hard-to-reach areas,[33,34,37]. Similar finding was reported stressing on the role of community outreach in promoting PrEP uptake.[37]

Looking at this from a government initiative point of view, our findings revealed numerous factors that, if put into action, could enhance the scale of PrEP. These measures involved ensuring a consistent supply of PrEP, preventing shortages, utilizing location-based apps to advertise PrEP within communities, and using electronic and print media to educate on stigma and promote awareness of PrEP.[42,56,59] Smartphones use for instance could present a chance for adherence solutions. Text messaging could potentially enhance PrEP retention, as studies suggest it is well-received and effective.

Furthermore, it is possible to create apps that show medication reminders in order to promote adherence, encourage self-reporting, and offer rewards for good adherence.[3,71] In addition, incorporating a PrEP utilization initiative within a comprehensive global preventative plan that includes counseling, STI testing, safe sex education, and advocacy, as well as transitioning from a

risk-focused method to a health promotion strategy, were all ways to enhance and encourage the adoption of PrEP.

Also, it is important to initiate discussions regarding the decriminalization of laws that target same-sex relationships and sex work in various countries, as these laws hinder individuals from openly disclosing their status.[37] This would guarantee the ability to freely access healthcare and openly discuss one's sexuality, which would help healthcare providers reach everyone with necessary information, education, and resources. The prospect of facing punishment, violence, or imprisonment deters many individuals from seeking necessary healthcare services. Therefore, collaborating with public, private, and NGO stakeholders could eliminate this boundary and enhance the use of PrEP. Considering the possibility of providing services in public, private, and NGO settings could expand key populations' options to align with their preferences and increase access.

Barriers to PrEP Uptake and Use

Barriers at the individual level involve time limitations mainly for female sex workers. Because of the type of work they do, most female sex workers struggled to regularly visit the healthcare facilities for follow-up and to get PrEP. Hence, the importance of having less frequent dosing regimens is imperative in tackling such obstacles as well as the necessity for outreach programs and mobile clinics to provide services to the them in their local communities.[5,33,37]

Socio-economic and demographic factors were also found to impede PrEP adoption and uptake. These include factors like being unemployed, experiencing homelessness or unstable housing, facing financial insecurities and vulnerabilities, having a low income, dealing with daily life logistics, facing transportation difficulties due to distance between residence and uptake points,

having low education and literacy levels.[26,29,34,35,36,38,41,42,50,51,56] These factors are essential components for an individual's overall well-being according to the WHO definition of health.[72] Fulfilling one's basic survival needs takes precedence over the consistent use of PrEP.[20] In addition, medication-related cost was cited as a barrier to the use of PrEP.[20] Therefore, emphasizing that the institution of PrEP is a form of public policy highlights the crucial role governments must play in addressing not only financial challenges but also various social barriers affecting the entire spectrum of PrEP-related care and utilization.

Psychologically, depression and loneliness were also identified as obstacles to the adoption of PrEP.[26,46] Mental health is not given much importance in Sub-Saharan Africa especially in west Africa, despite the fact that being mentally stable is essential for overall health.[72] Mental illness can hinder a person's willingness and ability to seek healthcare, making them more vulnerable to physical harm.[72,73] This was further enlightening that one's motivation to PrEP use decreases following an experience of traumatic events such as violence and rape or following the death of a family member.[20]

The fear of drug resistance, due to the inherent properties of the drug, was identified as a significant obstacle to PrEP acceptance and use.[30,38,53] There are concerns that individuals taking PrEP who become HIV-positive may not respond to antiretroviral therapy (ART).[3] Nonetheless, a study using Randomized Control Trials on the efficacy of PrEP stated that developing resistance to ART is uncommon, even if one begins ART after taking PrEP and subsequently contracts HIV.[74] More so, doubts were expressed about the potential negative impacts of medications and misconceptions surrounding the use of PrEP.[3,20,37] Despite reports of kidney injury, bone loss, vomiting, drowsiness, and lethargy in research, PrEP is considered generally safe for extended use due to its favorable safety profile, with only minimal side effects that are outweighed by its benefits.[3,20,75]

Moreover, in most cases, these adverse effects were reported to decrease after consistent use in the first month, highlighting a need for strategies to address these effects and support users in continuing therapy.[20]

Interpersonal level barriers to PrEP cited include stigma. For certain partners, parents, and friends, using PrEP was seen as a sign of having HIV or being linked to specific high-risk communities. [28,34,36,37,38,39,51,53,55,56,57] This could potentially result in a certain sort of social stigma. Stigma is consistently identified in most studies as a significant barrier in the adoption and utilization of PrEP. Stigma can manifest in various ways. For example, female sex workers experienced stigma due to their involvement in "the sex work" community and their beliefs about sex work and STIs .[20] Fighting against social stigma, advocating for, valuing, and safeguarding human rights is essential for human development. Hence, to effectively address HIV through PrEP, it is crucial to employ rights-based strategies to confront the widespread stigma, discrimination, and human rights abuses experienced by at-risk populations and those with HIV.[20]

Lack of access to PrEP services, and limited coverage were environmental level barriers reported to be impacting PrEP awareness and usage.[57] Expanding PrEP services and utilizing mobile clinics is necessary to reach communities and inaccessible areas. Concerns about logistics, such as poor road networks and breakdown trucks, also contributed to the limited uptake of PrEP.[33] This highlights the necessity of viewing PrEP delivery services and other healthcare delivery services as complex, encompassing initiatives from the government down to local communities.

At the institutional level, healthcare workers' stigma and discrimination are the significant barrier to the adoption of PrEP.[26,33,34,38] Stigma in healthcare settings may arise when individuals receiving PrEP services from specialized clinics, such as ART clinics. These individuals are mistakenly perceived as HIV positive and are therefore avoided by others. However, other research has also

stated the importance of integrating PrEP services into mainstream services in order to avoid marginalizing PrEP up takers.[3,69,70]

Furthermore, healthcare worker's lack of motivation, insufficiency in raising awareness and education on PrEP usage and safety, complicated medication acquisition processes, numerous hospital appointments, and perceived inefficiency in healthcare delivery were all identified as obstacles to PrEP utilization and compliance.[33,42] Additionally, the complexity in the guidelines for adhering to non-daily routines indicates that sustaining continued usage may necessitate extra focus, specialized resources, and support.[20] Certain barriers within health systems primarily revolve around challenges related to accessing clinical or pharmacy services, such as issues with insurance, transportation, navigating complex health systems, and logistical factors pertaining to health services. MSM and SGM are usually discouraged from accessing PrEP and other health services due to gender disparities and the criminalization of sex work. Allowing these individuals to have access would lead to improved self-reported health and decreased HIV spread.

LIMITATIONS AND STRENGTHS

Even with thorough attempts to conduct a comprehensive search, the researchers may still miss out on some eligible studies. This is because the present study included only research published exclusively in English Language, and in a limited number of databases hence. Due to a lack of advance comprehension of French or other native languages, time constraints during the thesis work from which this manuscript is derived and unavailability of contributing member or resource personnel to help in translation of published work in other languages to English, this review had to be restricted to only literature published in English and though it infers the non-representativeness of all West African countries, the study did include literature published in Anglophone, Francophone and Lusophone countries centering on countries with higher burden of HIV in West-Africa which therefore had been numerous trials, studies and literature on HIV conducted.

Additionally, most of the included studies focused on MSM and FSW, potentially leading to a bias against other key populations.

Moreover, the study looked at the perspectives of both facilitators and barriers for the at-risk groups. However, studying specific challenges per country and at-risk population would or might provide a more comprehensive understanding of the unique challenges these group encounter in their various countries in addition to unique facilitators that could help address these challenges.

Despite the above limitations, the review adopted a thorough search process in examining the literature, especially from well-known databases, and likewise, the researchers conducted a structured, standardized, and rigorous review process.

CONCLUSION

PrEP being a novel HIV preventive method, still gaining grounds particularly in Sub-Saharan Africa, with various PrEP studies, trials and research being conducted not only to determine its efficacy but also to promote its uptake and use, most high-risk populations in West Africa expresses have generally low levels of awareness and knowledge about this preventive method, however, however, findings from this study revealed a huge interest in this method when made available.

Various multifaceted barriers however serve as hindrances to PrEP uptake, use and adherence by these vulnerable populations and some of these barriers even contribute to the low level of awareness and knowledge among these groups. Notable of these barriers are socio-economic vulnerabilities, decreased perception of HIV risk by these high-risk groups, stigma which happens to be the single most important barrier not only to PrEP use but to most HIV related issues and lapses in health delivery systems. Therefore, addressing these barriers would not only ensure the intended efficacy of PrEP but would also require multifaceted and holistic approach that as well spanning from International to National to grassroot communities and then individual efforts.

On the other hand, various multifaceted facilitators were also identified and could also be seen as means to address these barriers. These include increasing PrEP education and awareness, employing peer-education and use of various identity networks to offer social support, creating a more conducive PrEP delivery atmosphere and various outreaches and use of mobile clinics to reach high-risk populations. These facilitators could play a role in increasing the use of PrEP among at-risk populations, especially in sub-Saharan Africa where there is a high prevalence of HIV and more effort is needed to provide preventive services to combat HIV/AIDS in the region.

ACKNOWLEDGEMENTS

The authors would like to thank all those who had contributed in diverse ways to make this study a success.

FUNDING STATEMENT

The authors have not declared a specific sponsorship or grant for this study from any funding organization.

COMPETING INTERESTS

The authors declare no competing interests with respect to both funding and ethics as the research required no formal funding or sponsorship and real-time participant involvement.

NB: However, it must be declared that, the research had been submitted as a dissertation for a master's degree International Public Health by same author at the Liverpool John Moores University in the UK, and with permission, being submitted for publication.

DATA AVAILABILITY STATEMENT

This scoping review draws from the data and research studies of various authors which have been put together to map out key findings. The data that support the findings of this study are available within the article and its supplementary materials manuscript and all authors of studies and literature included duly acknowledged and referenced.

REFERENCES

1 Beyrer C, McCormack S and Grulich, A. Pre-Exposure Prophylaxis for HIV Infection as a Public Health Tool. *The Journal of law, medicine & ethics: a journal of the American Society of Law, Medicine & Ethics*, 2022;50(S1): 24–28. doi: 10.1017/jme.2022.31**.**

2 NIAID. Pre-exposure prophylaxis (PrEP) to reduce HIV risk. NIH-NIAID.2020. https://www.niaid.nih.gov/diseases-condition/pre-exposure-prophylaxis-prep

3 Sidebottom D, Ekstrom AM and Stromdahl S. A systematic review of adherence to oral pre-exposure prophylaxis for HIV-how can we improve uptake and adherence? BMC Infectious Diseases.2020;18, 581. https://doi.org/10.1186/s12879-018-3463-4

4 Peng L, Cao Wangnan C, Gu J, Hao C, Li J, Wei D. Willingness to use and adhere to HIV Pre-Exposure Prophylaxis (PrEP) among men who have sex with men (MSM) in China. Int J Environ Res Public Health, 2019; 16(14): 2620.

5 Rogers BG, Chan PA, Sutten Coats C., et. al. Perspectives on long-acting formulations of pre-exposure prophylaxis (PrEP) among men who have sex with men who are non-adherent to daily oral PrEP in the United States. BMC Public Health 2023;23. 1643. https://doi.org/10.1186/s12889-023-16382-4

6 THEM, US. PrEP: The story of a sexual revolution. THEM.US.2020. https://www.them.us/story/prep-the-story-of-a-sexual-revolution

7 Singleton AL, Marshall BDL, Zang X, Nunn AS, Goedel WC. Added Benefits of Pre-Exposure Prophylaxis Use on HIV Incidence with Minimal Changes in Efficiency in the Context of High

Treatment Engagement Among Men Who Have Sex with Men. *AIDS Patient Care STDS*. 2020;34(12):506-515. doi:10.1089/apc.2020.0151

8 Centre for Disease Control and Prevention. PrEP for HIV prevention in the US. CDC-NHHSTP Newsroom.2023. https://www.cdc.gov/nchhstp/newsroom/fact-sheet/hiv/PrEP-for-hiv-prevention-in-the-us-factsheet

9 Mugo NR, Ngure K, Kiragu M, Irungu E and Kilonzo N. PrEP for Africa: What we have learnt and what is needed to move to program implementation. PMC. Curr Opin HIV/AIDS. 2016: 11(1):80-86. Doi:10.1097/COH.000000000000224

10 World Health Organinization. Consolidated guidelines on HIV prevention, diagnosis, treatment and care for key populations-2016 update.WHO.2016;155

11 World Health Organization. The top 10 causes of death. WHO, Geneva.2020. https://www.who.int/news-room/fact-sheet/detail/the-top-10-causes-of-death

12 Projet Atlas. HIV in West Africa. Atlas Project.2021. https://atlas.solthis.org/en/hiv-self-test-atlal-hiv-in-west-africa/

13 van Liere MJ. HIV and food security in sub-Saharan Africa. Royal Tropical Institute, The Netherlands.2022. https://www.kit.nl/wp-content/uploads/2018/08/455_AIDS-Food-Security-Paper-ECOWAS.pdf

14 World Health Organization. HIV/AIDS. WHO, Regional Office for Africa-World Health Organization.2023. https://www.afro.who.intl/health-topics/hivaids

15 Laurent C, Keita BD, Yaya I, Le Guicher G, et. al. HIV pre-exposure prophylaxis for men who have sex with men in West Africa: a multicountry demonstration study. The Lancet HIV.2021:8(7): e420-e428. https://doi.org/10.1016/s2352-3018(21)00005-9

16 Djomand D, Quaye S and Sullivan P. HIV epidemic among key populations in West Africa. Curr Opin HIV AIDS. 2014:9(5): 506-513

17 Eubanks A, Coulibaly B, Dembele Keita B, et. al. Socio-behavioral correlates of pre-exposure prophylaxis use and correct adherence in men who have sex with men in West Africa. BMC Public Health 2022; 22:1832. https://doi.org/10.1186/s12889-022-14211-8

18 Ayangeakaa S.D., Kerr J., Combs R.M. et, al. Sociocultural and structural influences on HIV pre-exposure prophylaxis (PrEP) engagement and uptake among African American young adults. BMC Public Health 2023; 23:1427. https://doi.org/10.1186/s12889-023-16273-8

19 Worldometer. Population of Western Africa. Worldometer. 2023. https://ww.worldometers.info/world--population/western-africa-population/

20 Antonini M, Silva IE, Elias HC, Gerin L, Oliveira AC, Reis RK. Barriers to Pre-Exposure Prophylaxis (PrEP) use for HIV: an integrative review. Rev Bras Enferm. 2023;76(3): e20210963. https://doi.org/10.1590/0034-7167-2021-0963

21 Arksey H, O'Malley L. Scoping studies: towards a methodological framework. Int J Soc Res Methodol. 2005;8(1):19–32.

22 Sophus A I & Mitchel JW. A review of approaches used to increase awareness of pre-exposure prophylaxis (PrEP)in the U.S. AIDS and Behavior.2019: 23:1749–1770 https://doi.org/10.1007/s10461-018-2305-0

23 Tricco AC, Lillie E, Zarin W, O'Brien KK, Colquhoun H, Levac D, et al. PRISMA extension for scoping reviews (PRISMA-ScR): checklist and explanation. Ann Intern Med. 2018;169(7):467–73.

24 Arnold T, Rubisten LB, Chan PA, Brumer AP, Bolonha ES, Beauchamps L, et al, 2017. Social, structural, behavioral and clinical factors influencing retention in Pre-Exposure Prophylaxis (PrEP) care in Mississippi. Plos One. 2017;12(2): e0172354. https://doi.org/10.1371/journal.pone.0172354

25 Mboup A, Behanzin L, Guedou AF, Geraldo N, Goma-Matsetse E. et. al. Early antiretroviral therapy and daily pre-exposure prophylaxis for HIV prevention among female sex workers in Cotonou, Benin: a prospective observational demonstration study. Journal of the International AIDS Society.2018; 21:11: e25208. https://doi.org/10.1002/jia2.25208

26 Eubanks A, Coulibaly B, Keita DB, Anoma C, Elias Dah TT, Mensah E, et. al. Loss to follow-up from HIV pre-exposure prophylaxis care in men who have sex with men in west Africa. Viruses. 2022; 14(11): 2380. Doi: 10.3390/v14112380

27 Laurent C, Keita BD, Yaya I, Le Guicher G, et. al. HIV pre-exposure prophylaxis for men who have sex with men in West Africa: a multicountry demonstration study. The Lancet HIV. 2021;8;7: e420-e428. https://doi.org/10.1016/s2352-3018(21)00005-9

28 Diabate S, Behanzin L, Guedou FA, Goma-Matsetse E, Olodo M. Pre-exposure prophylaxis in real life: experience from a prospective, observational and demonstration project among men who have sex with men in Benin, west Africa. J. Int AIDS Soc. 2023;26(6): e26130. Doi :10.1002/jia2.26130

29 Laurent C, Yaya I, Cuer B, Sagaon-Teyssier L, Mensah E, Dah TTE, et al. Human immunodeficiency virus seroconversion among men who have sex with men who use event-driven or daily oral pre-exposure prophylaxis (CohMSM-PrEP): A multi-country demonstration study from west Africa. Clin Infect Dis. 2023;22; 77(4):606-614 doi: 10.1093/cid/ciad221. PMID:37052469

30 Diabate S, Kra O, Biekoua YJ, Pelletier SJ Osso DG., et. al. Pre-exposure prophylaxis among men who have sex with men in Cote d'Ivoire: a quantitative study of acceptability. AIDS Care.2021; 33:9, 1228-1236, doi: 10:1080/09540121.2020.1785997

31- Folayan MO, Aliyu S, Oginni A, Ezechi O, Kolawole G, Ezeama N. Effectiveness of three delivery models for promoting access to pre-exposure prophylaxis in HIV-1 serodiscordant couples in Nigeria. PLoS One. 2022: 17(5): e0268011. Doi: 10.1371/journal.pone.0268011

32- Ogunbajo A, Leblanc NM, Kushwaha S, Boakye F, Hanson S, Smith MDR and Nelson LE. Knowledge and acceptability of HIV pre-exposure prophylaxis (PrEP) among men who have sex with men (MSM) in Ghana. AIDS Care. 2020; 32(3): 330-336. Doi:10.1080/09540121.2019.2675858 PMID: 32597455

33- Becquet V, Nouaman M, Plazy M, Agoua A, Zebago C, et. al. A community-based healthcare package combining testing and prevention tools, including pre-exposure prophylaxis (PrEP), immediate HIV treatment, management of hepatitis B virus, and a sexual and reproductive health (SRH), targeting female sex workers (FSWs) in Cote d'Ivoire: the ANRS 12381 PRINCESSE project. BMC Public Health.2021 21:2214 https://doi.org/10.1186/s12889-021-12235-0

34 Becquet V, Nouama M, Plazy M, Masumbuko J, Anoma C, Kouame S, Danel C, Eholie PS and Larmarange J et. al. Sexual and reproductive health needs of female sex workers in Cote d'Ivoire: A mixed methods study to prepare the future implementation of pre-exposure prophylaxis (prep) for HIV prevention. BMJ Open. 2020; 10(1): e028508. Doi: 10.1136/bmjopen-2018-028508 PMID: 31919122

35 Durosinmi-Etti O, Nwala EK, Oki F, Ikpeazu A, Godwin E, Umoh P, Shaibu A, Ogundipe A, Kalaiwo A. Willingness to pay for HIV prevention commodities among key population groups in Nigeria. Glob Health Sci Pract. 2022;10(5): e2100303. Doi: 10.9745/GHSP-D-21-00303. PMID: 36316139

36 Eubanks A., Dembele Keita B., Anoma C., Dah TTE, Mensah E, Maradan G., Bourrelly M, et. al. Reaching a different population of MSM in west Africa with the integration of PrEP into a comprehensive prevention package (CohMSM-PrEP ANRS 12369-Expertise France). J. Acquir Immune Defic Syndr. 2020;85(3):292-301 doi: 10.1097/QAI.0000000000002453. OMID: 32732768

37 Reyniers T, Babo SAY, Ouedraogo M, Kanta I, Agbegnigan L, et. al. Strategies to improve PrEP uptake among west African men who have sex with men: a multi-country qualitative study. Front. Public Health, 2023;11. https://doi.org/10.3389/fpubh.2023.1165327

38 Gyamera AO, Kinzer E, Aidoo-Frimpong G, Sorensen G, et. al. PrEP knowledge, acceptability and implementation in Ghana: Perspectives of HIV services providers and MSM, trans women, and gender diverse individuals living with HIV. PLOS Glob Public Health. 2023; 3(6): e0001956. Doi: 10.1371/journal.pgph.0001956

39 Coulaud PJ, Sagaon-Teyssier L, M'madi Mrenda B, Marandan G, Mora M, CohMSM Study Group et. al. Interest in HIV pre-exposure prophylaxis in men who have sex with men in West Africa (CohMSM ANRS 12324-Expertise France). Trop Med Int Health. 2018; 2023(10):1084-1091. Doi:10.1111/tmi.13129. Epub 2018 Aug 29. PMID: 30055043

40 Adeyemi OA, Nowak RG, Marzinke M, Morgan D, Sam-Agudu N, Craddock J, Zhan M, et. al. Correlates of self-reported and biomarker based-adherence to daily oral HIV pre-exposure prophylaxis among a cohort of predominantly men who have sex with men in Nigeria. PLoS One. 2023; 18(3): e0282999. Doi: 10.1371/journal.pone.0282999. PMID: 36928630

41 Guure C, Afagbedzi S and Torpey K. Willingness to take and ever use of pre-exposure prophylaxis among female sex workers in Ghana. Medicine (Baltimore). 2022; 101(5): e28798. Doi:10.1097/MD.0000000000028798

42 Ahouada C, Diabate S, Mondor M, Alary M, et. al. Acceptability of pre-exposure prophylaxis for HIV prevention: Facilitators, barriers and impact on sexual risk behaviours among men who have sex with men in Benin. BMC Public Health.2020;1267. https://doi.org/10.1186/s12889-020-09363-4

43 Ajayi AI, Ismail KO, Adeniyi OV, Akpan W. Awareness and use of pre-exposure and postexposure prophylaxes among Nigerian university students. Medicine (Baltimore), 2018; 97(36): e12226. Doi: 10.1097/MD.0000000000012226

44 Sarr M, Gueye D, Mboup S et.al. Uptake, retention and outcomes in a demonstration project of pre-exposure prophylaxis among female sex workers in public health centers in Senegal. International Journal of STD & AIDS. 2020; 31(11):1063-1072 doi: 10.1177/0956462420943704

45 Mboup A., Behanzin L, Guedou F, Giguere K, Geraldo N, et. al. Comparison of adherence measurement tools used in pre-exposure prophylaxis demonstration study among female sex workers in Benin. Medicine (Baltimore). 2020; 99(21): e20063. Doi:10.1097/MD.0000000000020063.

46 Ogubanjo A, Iwuagwu S, Williams R, Biello K and Mimiaga M. Awareness, willingness to use, and history of HIV PrEP use among gay, bisexual and other men who have sex with men in Nigeria. PLoS One. 2019; 14(12): e0226384. Doi: 10.1371/journal.pone.0226384

47 Giguere K, Behanzin L, Guedou FA, Talbot D, Leblond F, et. al. PrEP use among female sex workers: No evidence for risk compensation. J Acquir Immune Defic. Syndr. 2019; 82(3): 257-264. Doi: 10.1097/QAI.0000000000002134 PMID: 31356468

48 Mboup A, Diabate S, Behanzin L, Guedou FA, Zannou DM, et. al. Determinants of HIV pre-exposure prophylaxis adherence among female sex workers in a demonstration study in cotounou, Benin: A behavioural and demographic factors. Sex Transm Dis. 2021; 48(8) 565-571. Doi:10.1097/OLQ.0000000000001373

49 Ramadhani HO, Crowell TA, Nowak RG, Adebajo S, Kayode BO, Ononaku U, Bara SD, Ndembi N, Charurat ME, TRUST/RV 368 Study Group. Determinants of preexposure prophylaxis cascade among sexual and gender minorities in Nigeria. Sex Transm Dis.2023: 50(9):559-566. Doi:10.1097/OLQ.0000000000001841

50 Eubanks A, Coulibaly B, Dembele Keita B, Anoma C, Dah ETT, Mensah E, et al. Socio-behavioral correlates of pre-exposure prophylaxis use and correct adherence in men who have sex with men in west Africa. BMC Public Health. 2022; 22: 1832. Doi: 10.1186/s12889-022-14211-8

51 Emmanuel G. Folayan M, Undelikwe G, Ochonye B, Jayeoba T, Yusif A, et. al. Community perspectives on barriers and challenges to HIV pre-exposure prophylaxis access by men who have sex with men and female sex workers access in Nigeria. BMC. Public Health. 2020;20(1):69. Doi: 10.1186/s12889-020-8195-x. PMID:31941469

52 Ahouada C, Diabate S, Mondor M, Hessou S, et. al. Acceptability of pre-exposure prophylaxis for HIV prevention: Facilitators, barriers and impact on sexual risk behaviors among men who have sex with men in Benin. BMC Public Health. 2020; 20: 1267. Doi:10.1186/s12889-020-09363-4

53 Idoko J, Folayan MO, Dadem NY, et. al. "Why should I take drugs for your infection?": Outcomes of formative research on the use of HIV pre-exposure prophylaxis in Nigeria. BMC Public Health. 2015;349. https://doi.org/10.1186/s12889-015-1690-9

54 Ochonye B, Folayan MO, Fatusi AO, Bello BM, Ajidagba B, Emmanuel G, Umoh P, Yusuf A, and Jaiyebo T. Sexual practices, sexual behaviour and HIV risk profile of key populations in Nigeria. BMC Public Health. 2019;19(1):1210. Doi.10.1186/s12889-019-7553-z. PMID: 31477063

55 Strömdahl S, Onigbanjo Williams A, Eziefule B, Emmanuel G, Iwuagwu S, Anene O, Orazulike I, Beyrer, C, & Baral S. An assessment of stigma and human right violations among men who have sex with men in Abuja, Nigeria. BMC international health and human rights, 2019;1;7. https://doi.org/10.1186/s12914-019-0190-x

56 Eubanks A, Coulibaly B, Dembélé Keita B, Anoma C, Dah TTE, Mensah E, Maradan G, Bourrelly M, Mora M, Riegel L, Rojas Castro D, Yaya I, Spire B, Laurent C, Sagaon-Teyssier L,

& and the COHMSM-PrEP Study Group. Rate and Predictors of Ineffective HIV Protection in African Men Who Have Sex with Men Taking Pre-Exposure Prophylaxis. *AIDS and behavior*. 2022;*26*(11), 3524–3537. https://doi.org/10.1007/s10461-022-03692-8

57 Pelletier SJ, Gagnon M, Diabaté S, Kra O, Biékoua Y, Osso GD, Diané B, N'Dhatz-Ebagnitchié M, Ahouada C, Alary M. Pre-Exposure Prophylaxis (PrEP) in Men Who have Sex with Men in Bouaké, Côte d'Ivoire: A Qualitative Evaluation of Acceptability. The Open AIDS Journal. 2019;13; 49-58. https://doi.org/10.2174/1874613601913010049

58 Mboup A, Behanzin L, Guedou FA, Geraldo N, Goma-Matsetse E, Giguere K, et. al. Early antiretroviral therapy and daily pre-exposure prophylaxis for HIV prevention among female sex workers in Cotonou, Benin: a prospective observational demonstration study. Mboup A et al. Journal of the International AIDS Society.2018;21: e25208 https://doi.org/10.1002/jia2.25208

59 Ogunbajo A, Lodge W, Restar AJ, Oginni OA, Iwuagwu S, Williams R, Biello K, & Mimiaga MJ. Correlates of Geosocial Networking Applications (GSN Apps) Usage among Gay, Bisexual, and Other Men Who Have Sex with Men in Nigeria, Africa. Archives of sexual behavior.2021;*50*(7), 2981–2993. https://doi.org/10.1007/s10508-020-01889-3

60 Adeyemi OA, Nowak RG, Marzinke M, Morgan D, Sam-Agudu, N, Craddock J, Zhan M, Crowell TA, Baral S, Ndembi N, Adebajo S, Charurat ME, & TRUST/RV368 Study Group. Correlates of self-reported and biomarker-based adherence to daily oral HIV pre-exposure

prophylaxis among a cohort of predominantly men who have sex with men in Nigeria. PloS one. 2023;*18*(3), e0282999. https://doi.org/10.1371/journal.pone.0282999

61 Sabin LL, Beard J, Agyarko-Poku T, DeSilva M, Ashigbie P, Segal T, Esang M, Asafo MK, Wondergem P, Green K, Wambugu S & Adu-Sarkodie Y. "Too Much Sex and Alcohol": Beliefs, Attitudes, and Behaviors of Male Adolescents and Young Men Who have Sex with Men in Ghana. The open AIDS journal. 2018;*12*, 69–80. https://doi.org/10.2174/1874613601812010069

62 CIA.gov. HIV/AIDS-adult prevalence rate. World Factbook Archive. CIA.2022 https://www.cia.gov/the-world-factbook/about/archives/2022/field/hiv-aids-adult-prevalence-rate/country-comparison

63 Roehr B. FDA approves first drug to prevent HIV infection. BMJ. 2012;345 doi: https://doi.org/10.1136/bmj.e4879

64 Munyaneza A, Patel VV, Gutierrez NR, Shi Q, Muhoza B et. al. Awareness and willingness to use HIV Infection pre-exposure prophylaxis among Rwandan men who have sex with men: Findings from a web-based survey.2023. Doi: https://doi.org/10.1101/2023.11.01.23297747

65 Ayala G, Makofane K, Santos G, Beck J, et. al. Access to basic HIV-related services and PrEP acceptability among men who have sex with men worldwide: barriers, facilitators and implications for combination prevention. Hindawi Publishing Corporation. Journal of Sexually Transmitted Diseases. 2023;2013. Article ID 953123, 11 pages. https://dx.doi.org/10.1155/2013/953123

66 Strauss BB, Greene GJ, Phillips G 2nd, Bhatia R, Madkins K, Parson JT and Mustanski B. Exploring patterns of awareness and use of HIV pre-exposure prophylaxis among young men who have sex with men. AIDS Behav. 2017; 21(5): 1288-1298. Doi:10.1007/s110461-016-1480-0 PMID: 27401537

67 Yi S, Tuot S, Mwai G W, Ngin C, Chhim K, Pal K, Igbinedion E, Holland P, Choub CS and Mburu G. Awareness and willingness to use HIV pre-exposure prophylaxis among men who have sex with men in low-and middle-income countries: a systemic review. J Int. AIDS Soc. 2017; 20(1): 21580. Doi: 10.7448/IAS.20.1.21580

68 Reyniers T, Zimmermann HML, Davidovich U, Vuylsteke B, Laga M, et. al. The social meanings of PrEP use-a mixed methods study of PrEP use disclosure in Antwerp and Amsterdam. Sociology of Health & Illness. 2021;43(6),1311-1327. https://doi.org/10.111/1467-9566.13283

69 Daughtridge GW, Conyngham SC, Ramirez N and Koenig HC. I am men's health: Generating adherence to HIV pre-exposure prophylaxis (PrEP) in young men of color who have sex with men. J Int Assoc Provid AIDS Care. 2015; 14(2):103-107 doi:10.1177/2325957414555230

70 Golub SA, Pena S, Hilley A, Pachankis J and Radix A. Brief behavioral intervention increases PrEP drug levels in a real-world setting: Conference on retroviruses and opportunistic infections, Seattle.P. 2017.

71 Khospropour CM, Lester RT, Golden MR and Dombrowski JC. Text messaging is associated with improved retention in a clinic-based prep program: Conference on retroviruses and opportunistic infections, Seattle. P. 2017.

72 World Health Organization. Constitution of the World Health Organization. WHO,Geneva. 2023. https://www.who.int/about/accountability/governance/constitution

73 Bhandari S. How does mental health affect physical health? WebMD. Mental Health. Reference. 2021.Review. https://www.webmd.com/mental-health/how-does-mental-health-affect-physical-health

74 Gibas KM, van den Berg P, Powell VE, Krakower DS. Drug resistance during HIV pre-exposure prophylaxis. Drugs. 2019; 79(6): 609-619 doi: 10.1007/s40265-019-01108-x

75 Volpe K.D. Bone, renal risk factors found in majority of patients on HIV PrEP. Clinical Advisor. 2023. https://www.clinicaladvisor.com/home/topics/hiv-aids-information-center/bone-renal-risk-factors-hiv-prep/