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# Community-Based HIV Pre-Exposure Prophylaxis Implementation in Sub-Saharan Africa: A Review

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## ABSTRACT

Human immunodeficiency virus (HIV) remains a significant public health challenge in sub-Saharan Africa, where the region continued to account for nearly two-thirds of the global disease burden. Although antiretroviral therapy had transformed outcomes, the incidence of new infections remains high, particularly among adolescents, young women, men who have sex with men, and key vulnerable populations. The use of antiretroviral drugs by HIV-negative individuals at risk, has emerged as a cornerstone prevention strategy. The purpose of this review was to evaluate community-based approaches to PrEP implementation in sub-Saharan Africa, focusing on access, adherence, pharmacological efficacy, and programmatic outcomes. This review was composed through a systematic search of PubMed, Scopus, and Web of Science for articles published between 2012 and 2025, restricted to English-language studies conducted in sub-Saharan Africa or global studies with regional relevance, synthesizing evidence narratively. Findings indicated that community-led distribution, task-shifting to non-specialist providers, integration with sexual and reproductive health services, and digital adherence tools improve PrEP uptake and retention. Pharmacokinetic studies demonstrated that daily oral tenofovir disoproxil fumarate with emtricitabine achieves protective intracellular tenofovir diphosphate concentrations with steady-state levels reached after seven daily doses, while long-acting injectable cabotegravir shows favorable half-life (t1/2 ~40 days) and superior adherence outcomes. Nonetheless, barriers included stigma, inconsistent supply chains, and insufficient youth-targeted interventions. Effective community-based strategies reduce HIV incidence and support UNAIDS 95-95-95 targets. Future programs must combine biomedical efficacy with locally tailored social and structural enablers.

**Keywords:** HIV prevention, PrEP, Sub-Saharan Africa, Community-based intervention, Adherence.

## INTRODUCTION

HIV continues to pose an enormous public health challenge in sub-Saharan Africa, which accounts for approximately 70% of the global 38 million people living with HIV in 2015 [1,2]. The region also experiences nearly 1.5 million new infections annually, with young women aged 15–24 years disproportionately affected, representing 63% of all new infections in their age cohort [3]. Despite substantial advances in antiretroviral therapy, HIV incidence remains unacceptably high, and prevention efforts must be intensified [4]. Pre-exposure prophylaxis (PrEP) has emerged as a highly effective biomedical strategy, capable of reducing HIV acquisition risk by more than 90% when adherence is optimal [5].

The importance of PrEP in sub-Saharan Africa is underscored by contextual drivers of transmission including poverty, gender inequality, stigma, and substance abuse, all of which intersect with structural health system limitations [6]. Implementation of PrEP through community-based models addresses these challenges by expanding access beyond formal health facilities, engaging trusted local actors, and reducing stigma barriers [7]. Early studies demonstrate that decentralized PrEP distribution improves uptake among hard-to-reach populations including adolescents, sex workers, and men who have sex with men [8]. This review provides a comprehensive synthesis of community-based PrEP implementation in sub-Saharan Africa. The purpose is to critically evaluate evidence from pharmacological, clinical, and programmatic perspectives. The review first outlines pharmacological underpinnings of PrEP efficacy, then examines community delivery strategies, addresses barriers and facilitators of adherence, and finally discusses future directions and clinical implications. By integrating biomedical, behavioral,

and structural insights, this article aims to inform researchers and clinicians on effective approaches to strengthen PrEP delivery in sub-Saharan Africa.

**Pharmacological Basis of PrEP Efficacy**

PrEP efficacy relies on achieving and sustaining protective drug concentrations in relevant tissue compartments. Daily oral PrEP using tenofovir disoproxil fumarate (TDF) and emtricitabine (FTC) demonstrates strong pharmacokinetic (PK) and pharmacodynamic (PD) profiles. Steady-state intracellular concentrations of tenofovir diphosphate, the active metabolite, are typically reached after seven consecutive daily doses [9]. Protective efficacy is associated with trough intracellular levels exceeding 16 fmol/10^6 peripheral blood mononuclear cells (PBMCs) [10]. In women, cervicovaginal tissue concentrations are lower compared with rectal tissue, necessitating higher adherence to ensure protection [11].

Alternative PrEP formulations address adherence challenges. Long-acting injectable cabotegravir (CAB-LA), an integrase strand transfer inhibitor, demonstrates a half-life (t1/2) of approximately 40 days, enabling bimonthly intramuscular administration [12]. The HPTN 083 and 084 trials revealed superior efficacy of CAB-LA compared to oral TDF/FTC, with 66% relative risk reduction in men who have sex with men and transgender women, and 89% reduction in cisgender women [13]. Vaginal rings delivering dapivirine provide sustained release over 28 days, with mean plasma concentrations of 0.5–2.0 ng/mL and good tolerability, though efficacy is lower than oral or injectable PrEP [14].

The pharmacological diversity of PrEP options broadens opportunities for tailoring prevention to community needs. Daily oral PrEP remains the most widely available in sub-Saharan Africa, but implementation studies suggest long-acting formulations may overcome adherence barriers in real-world contexts [15].

**Community-Based Delivery Models**

Community-based PrEP delivery models aim to decentralize access and integrate services into existing community structures. Task-shifting from physicians to trained nurses, community health workers, and peer educators has been effective in expanding PrEP coverage [16]. In Kenya, peer-led distribution within sex worker networks increased uptake by 45% compared with facility-based care [17]. Similarly, adolescent-focused outreach in South Africa demonstrated higher initiation rates when services were provided in schools and youth centers [18].

Mobile health (mHealth) tools enhance adherence monitoring. Short message service (SMS) reminders and app-based check-ins improve adherence rates by 20–30% in community cohorts [19]. Integration with sexual and reproductive health services facilitates PrEP uptake among women by reducing stigma associated with accessing HIV-specific clinics [20]. Community-based pharmacies also offer promising venues, particularly in urban centers where pharmacies are often the first point of healthcare contact [21].

**Barriers to Implementation**

Despite progress, substantial barriers hinder effective community-based PrEP delivery. Stigma remains a dominant obstacle, with PrEP users often mistaken for individuals already living with HIV [22]. Inconsistent drug supply chains lead to stockouts that undermine community trust [23]. Additionally, socioeconomic barriers, including transport costs and opportunity costs of clinic visits, disproportionately affect young women and key populations [24].

Adherence remains variable, with discontinuation rates of 30–50% within the first six months in some community programs [25]. Pharmacokinetic studies confirm that inconsistent use reduces intracellular drug levels below protective thresholds, leaving individuals vulnerable [8,9]. Furthermore, concerns about resistance emergence in cases of acute HIV infection during PrEP use require continued surveillance [26].

**Future Directions and Clinical Implications**

Future implementation must balance biomedical efficacy with social and structural enablers. Long-acting PrEP formulations such as CAB-LA may address adherence limitations but require careful rollout to ensure equity and affordability [10,11,]. Expanded training of community health workers, inclusion of nutritional and mental health services in prevention packages, and digital adherence innovations will be critical is the future of HIV PrEP [27].

At the clinical level, improved pharmacogenomic studies are needed to identify variability in drug metabolism and optimize dosing strategies. At the programmatic level, scaling PrEP requires integration with national HIV prevention plans and financing models that sustain supply chains. Importantly, community engagement in design and delivery of PrEP services ensures cultural alignment and improves trust.

## CONCLUSION

Community-based PrEP implementation in sub-Saharan Africa demonstrates clear potential to reduce HIV incidence when biomedical efficacy is combined with contextually relevant delivery strategies. Oral TDF/FTC remains effective when adherence is sustained, while long-acting formulations such as CAB-LA offer promising alternatives with superior pharmacological properties. Community models that leverage peer educators, pharmacies, schools, and digital adherence tools expand access and improve retention. Persistent barriers such as stigma, stockouts, and youth-specific challenges underscore the need for comprehensive, integrated approaches. Evidence highlights that PrEP is most effective when embedded within broader community health systems that address both

biomedical and structural determinants of HIV risk. Researchers and clinicians should prioritize scaling sustainable, community-led PrEP delivery models that integrate biomedical efficacy with culturally tailored social support.

## REFERENCES


1. Obeagu, E.I., Alum, E.U. and Obeagu, G.U. Factors Associated with Prevalence of HIV Among Youths: A Review of Africa Perspective. Madonna University Journal of Medicine and Health Sciences. 2023; 3(1):13-18. https://madonnauniversity.edu.ng/journals/index.php/medicine
2. Okon, M. B., Alum, E. U., Ugwu, O. P.C., Obeagu, E. I. Curtailing HIV/AIDS Spread: Impact of Religious Leaders. *Newport International Journal of Research in Medical Sciences (NIJRMS)*, 2023; 3(2): 28-31.
3. UNAIDS. Global AIDS Update 2023: The Path That Ends AIDS. UNAIDS. 2023; Geneva. https://www.unaids.org/en/resources/documents/2023/global-aids-update-2023
4. Ugwu, O.P.C., Egba, S.I., Uti, D.E., Ukaidi, C.U.A., Echegu, D.A. Confronting Dual Challenges: Substance Abuse and HIV/AIDS. Elite Journal of HIV. 2024; 2(5):1-8. https://epjournals.com/journals/EJHIV
5. Blumenthal, J., & Haubrich, R. (2013). Pre-exposure prophylaxis for HIV infection: how antiretroviral pharmacology helps to monitor and improve adherence. *Expert opinion on pharmacotherapy*, *14*(13), 1777-1785.
6. Madu, C.V., Aloh, H.E., Uti, D.E., Egba, S.I., et al. The price of progress: Assessing the financial costs of HIV/AIDS management in East Africa. Medicine (Baltimore). 2025 May 2;104(18):e42300. doi: 10.1097/MD.0000000000042300. PMID: 40324279
7. Celum, C., Baeten, J.M., Hughes, J.P., Barnabas, R., Heffron, R. Integrated implementation of PrEP and ART: A synergistic HIV prevention strategy. J Int AIDS Soc. 2019;22(S4):e25327. https://doi.org/10.1002/jia2.25327
8. Ezenwaji, C.O., Alum, E.U. & Ugwu, O.PC. Bridging the gap: telemedicine as a solution for HIV care inequities in rural and vulnerable communities. *Int J Equity Health* **24**, 205 (2025). https://doi.org/10.1186/s12939-025-02584-2
9. Cottrell, M.L., Yang, K.H., Prince, H.M., Sykes, C., White, N., Malone, S., Dellon, E.S., Madanick, R.D., Shaheen, N.J., Hudgens, M.G., Kashuba, A.D. A translational pharmacology approach to predicting HIV pre-exposure prophylaxis outcomes in men and women using tenofovir disoproxil fumarate ± emtricitabine. J Infect Dis. 2016;214(1):55-64. https://doi.org/10.1093/infdis/jiw077
10. Hendrix, C.W., Andrade, A., Bumpus, N.N., Kashuba, A.D.M., Marzinke, M.A., Moore, A., Prince, H.A., Breaud, A., Wiggins, I., Radebaugh, C., Cao, Y.J., Yang, K., Fuchs, E.J. Dose frequency ranging pharmacokinetics of tenofovir-emtricitabine for HIV pre-exposure prophylaxis. J Acquir Immune Defic Syndr. 2016;71(5):530-537. https://doi.org/10.1097/QAI.0000000000000883
11. Cottrell, M.L., Srinivas, N., Kashuba, A.D.M. Pharmacokinetics of antiretrovirals in mucosal tissue. J Acquir Immune Defic Syndr. 2015;69(Suppl 1):S31-S40. https://doi.org/10.1097/QAI.0000000000000574
12. Landovitz, R.J., Donnell, D., Clement, M.E., Hanscom, B., Cottle, L., Coelho, L., Cabello, R., Chariyalertsak, S., Dunne, E.F., Frank, I., et al. Cabotegravir for HIV prevention in cisgender men and transgender women. N Engl J Med. 2021;385(7):595-608. https://doi.org/10.1056/NEJMoa2101016
13. Delany-Moretlwe, S., Hughes, J.P., Bock, P., Smith, K., Koenig, H.C., Rompalo, A., Bekker, L.G., Gaur, A.H., Koltun, W.D., O'Connor, C., et al. Cabotegravir for HIV prevention in cisgender women. N Engl J Med. 2022;387(7):627-638. https://doi.org/10.1056/NEJMoa2201049
14. Baeten, J.M., Palanee-Phillips, T., Brown, E.R., Schwartz, K., Soto-Torres, L.E., Govender, V., Mgodi, N., Matovu Kiweewa, F., Nair, G., Mhlanga, F., et al. Use of a vaginal ring containing dapivirine for HIV-1 prevention in women. N Engl J Med. 2016;375(22):2121-2132. https://doi.org/10.1056/NEJMoa1602046
15. Bekker, L.G., Hosek, S., Pettifor, A. Preventing HIV among young people: research priorities for the future. J Int AIDS Soc. 2015;18(2 Suppl 1):20276. https://doi.org/10.7448/IAS.18.2.20276
16. Mugo, P.M., Ngure, K., Kiragu, M., Irungu, E., Kilonzo, N. PrEP for Africa: what we have learnt and what is needed to move to program implementation. Curr Opin HIV AIDS. 2016;11(1):80-86. https://doi.org/10.1097/COH.0000000000000224
17. Ngure, K., Heffron, R., Curran, K., Vusha, S., Ngugi, E., Mugo, N., Baeten, J.M. I had to calm her down and then explain: Sexual communication among PrEP users and their partners in Kenya. AIDS Behav. 2016;20(7):1404-1411. https://doi.org/10.1007/s10461-016-1345-0
18. Stankevitz, K., Grant, H., Lloyd, J., Gomez, G.B., Kripke, K., Torjesen, K., Jahn, A. Oral preexposure prophylaxis continuation, measurement and reporting. AIDS. 2020;34(12):1801-1811. https://doi.org/10.1097/QAD.0000000000002590
19. Haberer, J.E., Bangsberg, D.R., Baeten, J.M., Curran, K., Koechlin, F.M., Amico, K.R., Mujugira, A., Morton, J., Nakyanzi, A., Mugo, N.R. Defining success with HIV pre-exposure prophylaxis: a prevention-effective adherence paradigm. AIDS. 2015;29(11):1277-1285. https://doi.org/10.1097/QAD.0000000000000647

20. Giovenco, D., Gill, K., Fynn, L., van der Straten, A., Bekker, L.G. Experiences of young women initiating PrEP in Cape Town, South Africa: a qualitative study. BMC Womens Health. 2021;21(1):204. https://doi.org/10.1186/s12905-021-01348-3
21. Eakle, R., Gomez, G.B., Naicker, N., Bothma, R., Mbogua, J., Cabrera, J., Saayman, M., Moorhouse, L., Rees, H. HIV pre-exposure prophylaxis and early antiretroviral treatment among female sex workers in South Africa: Results from a prospective observational demonstration project. PLoS Med. 2017;14(11):e1002444. https://doi.org/10.1371/journal.pmed.1002444
22. Velloza, J., Khoza, N., Scorgie, F., Chitukuta, M., Mutero, P., Mutiti, K., Makanani, B., Morton, J., Bekker, L.G., Baeten, J.M., Celum, C., van der Straten, A. The influence of HIV-related stigma on PrEP disclosure and adherence among adolescent girls and young women in HPTN 082. AIDS Behav. 2020;24(5):1494-1501. https://doi.org/10.1007/s10461-019-02790-0
23. Roberts, D.A., Barnabas, R.V., Abuna, F., Nyerere, P., Baeten, J.M., Ngure, K., Mugo, N.R., Lester, R.T. The role of costing in the introduction and scale-up of HIV pre-exposure prophylaxis: Evidence from recent studies in Kenya and Uganda. PLoS Med. 2019;16(9):e1002932. https://doi.org/10.1371/journal.pmed.1002932
24. Pintye, J., Beima-Sofie, K.M., Makabong, O.P., Njoroge, A., Trinidad, S.B., Heffron, R., Baeten, J.M. "I did not see a need to get PrEP": Narratives of adolescent girls and young women in Kenya. AIDS Patient Care STDS. 2020;34(8):336-343. https://doi.org/10.1089/apc.2020.0017
25. Celum, C., Hosek, S., Tsholwane, N., Kassim, S., Mukaka, S., Mutero, P., Khoza, N.,Chitukuta, M., Morton, J., Bekker, L.G., Baeten, J.M. PrEP uptake, persistence, and effectiveness in adolescent girls and young women in sub-Saharan Africa: A review of published data. Lancet HIV. 2021;8(8):e515-e528. https://doi.org/10.1016/S2352-3018(21)00070-8
26. Spinner, C.D., Hanhoff, N., Krznaric, I., Schabaz, S., Schewe, K., Weizsäcker, K., Knechten, H., Spinner, M., Degen, O., Esser, S. HIV pre-exposure prophylaxis (PrEP): A review of current knowledge of oral systemic HIV chemoprophylaxis. Infection. 2016;44(2):151-158. https://doi.org/10.1007/s15010-015-0850-2
27. Patel, P., Kerzner, M., Reed, J. B., Sullivan, P. S., & El-Sadr, W. M. (2022). Public health implications of adapting HIV pre-exposure prophylaxis programs for virtual service delivery in the context of the COVID-19 pandemic: systematic review. *JMIR Public Health and Surveillance*, *8*(6), e37479.


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