



Pre-Exposure Prophylaxis HIV during Pandemic Covid-19: Challenge and Strategy

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

The COVID-19 pandemic has caused obstacles in providing PrEP services for HIV prevention. The COVID-19 pandemic has led to a decline in the use of PrEP for HIV prevention. Social restriction policies and limited services are provided for fear of being infected with COVID-19. The aim is to review the challenges and strategies for providing HIV PrEP during the pandemic. This article narrative reviews the acceptance of the PrEP program according to The Theoretical Framework of Acceptability, challenges during the COVID-19 pandemic, and strategies during the COVID-19 pandemic. Affective attitude, burden, ethics, self-efficacy, and perception of effectiveness influence acceptance of the PrEP program. During the COVID-19 pandemic, several challenges were faced, including fear of transmission of COVID-19, disruption of access to health services, disruption of PrEP supplies, and shifting of priority for health workers to COVID-19. Strategies implemented

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during the pandemic to increase PrEP acceptance include telemedicine and remote counseling, mobile laboratories, medication home delivery, longer PrEP stocks, and online education and information. To support the PrEP program during the COVID-19 pandemic, collaboration and integration of PrEP and COVID-19 services are required.

Keywords: Pre-exposure prophylaxis; COVID-19; challenge.

ABBREVIATIONS

PrEP : Pre-Exposure Prophylaxis
SDG's : Sustainable Development Goals
WHO : World Health Organization
HIV : Human Immunodeficiency Virus
ARV : Antiretroviral
FSW : Female Sex Workers
PLHIV : People Living with HIV
STIs : sexually transmitted infections
MSM : Men who have Sex with Men
IDU : Injection Drug User
TFA : Theoretical, Framework of Acceptability
AIDS : Acquired Immunodeficiency Syndrome

1. INTRODUCTION

The COVID-19 pandemic is causing challenges to access to health services. The COVID-19 pandemic can impact people who are vulnerable to HIV infection. This condition can hinder public health services and impact public health. The modeling results found that the impact of COVID-19 on the HIV program led to an increase in HIV cases and deaths [1]. Therefore, we need a comprehensive policy under its control.

The SDG's target to end the AIDS epidemic by 2030 is to achieve three zero, which include zero new HIV infections as one of the main pillars. To achieve this goal, in September 2015, WHO recommended preventive or prophylactic therapy in the form of PrEP. PrEP is part of and in addition to the comprehensive prevention of HIV infection that already exists [2].

PrEP is the use of ARV drugs in people who are not infected with HIV before they are exposed to or infected with HIV and aims to prevent them from being infected with HIV. Those who take this PrEP have a high risk of becoming infected with HIV. If this PrEP is taken at the correct dose, it can reduce the risk of getting infected with HIV through risky sexual intercourse by more than 90% effectively [3]. However, in using PrEP, compliance is required and used according to the rules of use. High adherence to consuming PrEP can increase protection from HIV infection and vice versa. If adherence is less than optimal,

PrEP will not provide the expected protective benefits [4-6].

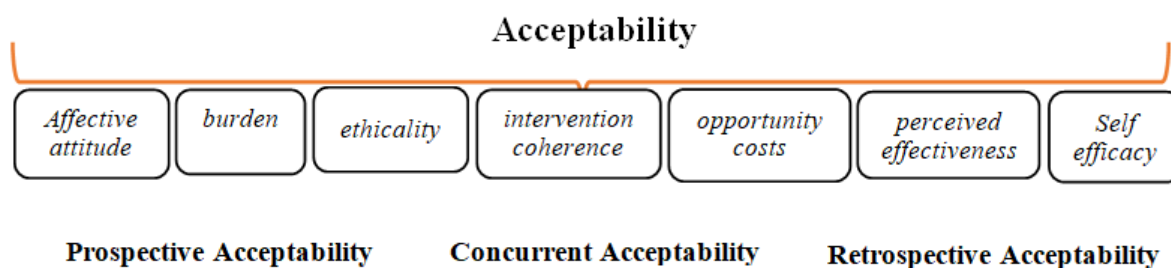
WHO has recommended the PrEP program since 2015 as a response to accelerated HIV control [7]. A systematic review study in America found that adherence to PrEP programs is related to the effectiveness of HIV prevention [8]. Research in Uganda found that family and friend support is needed to reduce stigma and support PrEP use in the FSW [9]. A study in Zimbabwe found that motivating FSWs to start a PrEP program consisted of intrinsic and extrinsic factors. Intrinsic factors consist of self-protection from HIV infection and broken condoms. Extrinsic factors consist of the risk of working as an FSW, increased opportunities to offer sex without a condom, positive encouragement from others, the need to care for children, and previous participation in research studies on HIV prevention and gender-based violence [10].

PrEP is not to replace pre-existing prevention methods. However, it is an additional prevention method that can be combined with other HIV prevention mechanisms such as condoms, lubricants, harm reduction, and ARV treatment for PLHIV. Please note that this PrEP cannot prevent transmitting sexually transmitted infections (STIs) such as syphilis, gonorrhea, and chlamydia. PrEP users still need additional protection, such as condoms, to prevent STIs.

During the COVID-19 pandemic, a social restriction policy made it difficult to provide health services. For this reason, it is necessary to study the theory of PrEP acceptance, factors that hinder the use of PrEP during the COVID-19 pandemic, and strategies to increase PrEP acceptance.

2. METHODS

This study is a literary narrative that examines research results related to PrEP acceptance, barriers to PrEP programs during the COVID-19 pandemic, and the strategies used. This study also uses The Theoretical Framework of Acceptability (Picture 1), a theory used to



Picture 1. The theoretical framework of acceptability [11]

understand the factors influencing the acceptance of health interventions or programs. This theory provides a framework for analyzing how individuals or groups accept or reject an innovation, intervention, or change in the health context. The Theoretical Framework of Acceptability consists of seven dimensions, namely (affective attitude, burden, ethicality, intervention coherence, opportunity costs, perceived effectiveness, and self-efficacy). By considering these dimensions, it is possible to identify the factors that influence acceptance and develop appropriate strategies to increase acceptance of a PrEP intervention or program.

This study is a narrative review using Pubmed, ScienceDirect, Scopus, Springer, and Google Scholar library sources. The study was conducted using the keywords "COVID-19", "Challenge," "Accepted," "PrEP HIV," and "Strategy." A literature search was carried out for the last five years (2018-2022) and was original research. All relevant articles were then reviewed. Studi untuk meninjau penerimaan Program PrEP dan tantangannya selama pandemi COVID-19.

3. RESULTS

3.1 The Theoretical Framework of Acceptability

Several studies related to the acceptance of PrEP, namely this HIV prevention drug, is intended for people who do not have HIV but have a high risk of contracting it, such as MSM, IDU, FSW, and others. Adapted to the Theoretical Framework of Acceptability (TFA) consisting of seven dimensions [11] These studies include:

3.1.1 Affective attitude

Attitude measures have been used to assess the acceptance of health interventions. The affective

attitude in question is about how an individual feels when taking part or participating in an intervention. They have a perception as a group that is vulnerable to HIV infection [10]. Those who know the benefits of PrEP tend to have an awareness of the high prevalence of HIV. FSWs tend to negotiate the use of condoms, do not believe in the quality of condoms, and perceive that using a condom means not trusting the client [12]. Support from family and friends to reduce stigma and health promotion for women and their families is crucial to increasing participation in HIV prevention programs [13].

3.1.2 Burden

A burden is defined as a heavy burden or effort. The perceived burden is the effort that is felt and required to participate in and accept or carry out a program intervention. In this theoretical framework, the load referred to is related to the burden of participation in interventions, such as participation in program interventions requiring time and money or too much cognitive effort, indicating this burden is too great.

The burden felt by several studies mentions the existence of stigma from families and communities, lack of awareness about PrEP, and lack of motivation to join a PrEP program [12-14]. Research in Uganda also mentions that barriers to PrEP are distance and lack of transportation, accessibility to health services, busy schedules, and forgetfulness [15]. Research in Malawi states that side effects are a barrier that can affect the use of PrEP [16]. Mistrust of health care professionals is also a concern [17].

3.1.3 Ethicality

Ethics can be defined as being morally good or being right. Ethics assesses the nature of truth and goodness from social behaviour based on traditions owned by individuals and society. In the ethical acceptance theory model, this is

interpreted as the extent to which the intervention program carried out has good conformity with truth and individual value systems [18].

Capitalizing on the success of existing HIV prevention programs, as well as social norms around HIV prevention behaviour, can have a positive impact on PrEP delivery in Sub-Saharan Africa [16]. Outreach and empowerment programs related to the benefits of PrEP in HIV prevention and reducing stigma can increase acceptance and adherence to PrEP [14,12,19]. Research in Uganda also mentions the need for public information campaigns, further training of health workers, provision of PrEP near at-risk communities, and promotion of community-based stigma reduction efforts [15].

3.1.4 Intervention coherence

Intervention coherence is defined as the participant's understanding of the intervention. This understanding is not only limited to knowing the intervention but also understanding how it works and the benefits of this intervention for these participants, including compatibility with other interventions. Policymakers should consider the priority of PrEP programs for living in high-prevalence areas and use self-testing for HIV to support acceptance of PrEP and facilitate the detection of HIV infection [20]. The need for ongoing risk reduction counseling in the administration of PrEP [21]. Studies in Ethiopia show that user-friendly strategies must be designed and implemented to overcome barriers and facilitate PrEP acceptance. There needs to be a program that consistently supports the fight against HIV infection. Programs should remind that PrEP is a method they can control and can support condom use. The information must consider their education and understanding to achieve a better HIV prevention strategy [22]. Knowledge of PrEP and equating it with contraception as a prevention modality is an educational strategy that can be developed naturally and effectively among peers [12].

3.1.5 Opportunity costs

Opportunity costs are costs incurred by someone when choosing or accepting a program. Opportunity costs can be defined as the extent to which profits, benefits, and values must be given or sacrificed to be able to participate in this program intervention. Someone who has HIV is prone to experiencing opportunistic infections as a result of weak immunity, such as tuberculosis infection,

candidiasis, herpes simplex, salmonella, digestive infections, toxoplasmosis, and others [23,24]. Lifetime HIV-related medical expenses incurred for a person with HIV amounted to \$420,285 [25]. In addition, opportunity costs are incurred, such as lost job opportunities, transportation costs, patient care costs, reduced life expectancy, and decreased work productivity [26,27].

3.1.6 Perceived effectiveness

Perceived effectiveness is the extent to which an intervention program can achieve its goals. Perceived effectiveness is the perceived belief that a PrEP program is effective at preventing HIV. Informants' belief in the benefits of the PrEP program in preventing HIV can influence their attitudes and actions. A positive perception of effectiveness encourages them to participate in the intervention activities. The study in China showed that the supporting factors for the PrEP program were education, moderate income compared to low income, never or rarely found a sexual partner via the internet in the last six months, history of sexually transmitted infections (STIs), more knowledge about AIDS, worry about HIV as a threat to himself and his family, had heard of PrEP, and believed that PrEP was effective in preventing HIV [21].

3.1.7 Self-efficacy

Self-efficacy is an individual's belief or self-confidence in exercising self-control, motivation, behavior, and the social environment. *Self-efficacy* is an individual's belief in his or her ability to perform the behaviors required to participate in an intervention program. Self-efficacy is the self-confidence to carry out the PrEP program. Research in Ethiopia also mentions that misconceptions about PrEP, their lack of self-confidence, the benefits and role of PrEP, and the side effects of PrEP are barriers to acceptance of PrEP programs [22]. Research in Zimbabwe found that the motivation for using PrEP was self-protection against HIV and the risk of breaking the condom. It is also associated with occupational risks associated with sex work, increased opportunities to offer unprotected sex as a motivator to start PrEP, positive encouragement from others, the need to care for children, and gender-based violence [10]. PrEP can provide extra protection from HIV along with condoms and STIs [16]. Confidence in the PrEP program can encourage active involvement in HIV prevention programs.

3.2 PrEP Challenges during the COVID-19 Pandemic

The existence of COVID-19 pandemic has caused some individuals to stop taking PrEP. Some of them reported not engaging in sexual activity. The study in France found that 58.8% (n=556) reported stopping PrEP during lockdown. Among the 556 who stopped PrEP during the lockdown, 86.5% (n=481) reported not engaging in sexual activity; 76.8% (n=427) restarted PrEP after the lockdown [28].

3.2.1 Fear of transmission of COVID-19

Groups of FSW, MSM, and groups who are vulnerable to HIV infection postpone visits and feel afraid to go to crowded health facilities or clinics during a pandemic for fear of contracting COVID-19 [29]. Fear of being infected with COVID-19 can hinder routine visits or counseling regarding PrEP, potentially affecting the continuity of PrEP use. Due to the COVID-19 pandemic, it was reported that several PrEP users were infected with COVID-19. They are also at risk of being infected with Covid-19 due to contact with patients or indirectly. Some PrEP users have reported being infected with COVID-19 or symptomatic. A study conducted in Brazil found that most individuals practice social distancing (68,52%) but still consume PrEP (75.93%). Few people had contact with suspected or confirmed cases of COVID-19 (12.04%). However, some had symptoms related to COVID-19 a month before the interview (27.78%), including rhinorrhea (56.67%), cough (53.33%), asthenia (50.00%) and headaches (43.33%) [30].

3.2.2 Impaired access to health services

The social distancing policy has limited access to health services. Most PrEP users are also required to follow the policy. Travel restrictions, clinic closures, or resource shifting to the COVID-19 response can impair healthcare access, including PrEP access. These policies may limit an individual's ability to obtain a PrEP prescription, have regular check-ups, or maintain adequate stocks of PrEP. A survey study of 74 participants at 12 clinics in San Francisco found that the challenges during the COVID-19 pandemic were access to the health care system, inability to go to the laboratory, inability to receive PrEP drugs, lack of communication with health care providers, difficulty getting an HIV test. Participants also experienced a decline

in mental health. Reported mental health is high anxiety (77%), increased stress (78%), and decreased sleep quality (49%) [31].

3.2.3 PrEP supply interruption

Discontinuation or delays in the supply of PrEP from manufacturers or distribution logistics may occur during the COVID-19 pandemic. Delays in drug supply can lead to shortages or difficulties in obtaining the PrEP medication needed, interfering with consistent use. The qualitative study found a shortage of drug supply during the COVID-19 pandemic, and pharmacists faced several challenges in procuring and storing medicines, managing unavailable medicines, dispensing medicines, and providing services such as drug delivery and patient counseling. A study in Brazil found that the main reasons for discontinuing PrEP use were barriers to taking PrEP refills in health services (95/204; 46.6%) and sexual abstinence (81/204; 39.7%). The main reasons for continuing PrEP were fear of HIV infection (327/529; 61.8%), sex with non-permanent partners (90/529; 17.0%), HIV-positive partner (63/529; 11.9%), and the belief that PrEP protects against COVID-19 (49/529; 9.3%) [32].

3.2.4 Transferring resources and changing priorities

Shifting resources and changing priorities within the health system to respond to the COVID-19 pandemic can reduce attention to and support for PrEP programs. Reduced focus on PrEP can lead to a lack of the information, education, and promotion needed to encourage PrEP use and maintenance. The pandemic has affected frontline workers' physical and psychological health, causing them to experience emotional distress such as fear, anxiety, depression, and stress. In addition, a pandemic can increase post-traumatic stress disorder, which causes burnout and disconnection of healthcare workloads to ensure patient safety and the quality of care [33].

3.3 PrEP Strategy during the COVID-19 Pandemic

3.3.1 Telemedicine and remote counseling

They were using communication technology such as telephone, video conferencing, or messaging applications to provide remote PrEP counseling and monitor the condition of PrEP users. This

technology is to get information without having to visit the clinic directly. Technological developments can assist in communicating with PrEP users. The social restriction policy makes it difficult for people to take medicine to health services. Through telemedicine technology, patients can minimize clinic visits, access information, and access PrEP treatment [34]. Research on PrEP reported that PrEP teleconsultation was experienced by 21.5% of PrEP users, and 89.0% reported being satisfied with this new procedure. High PrEP teleconsultation acceptance was reported at 70%. It was also found that higher education levels were associated with higher acceptance rates of PrEP teleconsultation (aOR: 1.62; 95% CI: 1.07–2.45) [35,36].

3.3.2 Mobile laboratory

The strategy of providing mobile laboratory facilities will make it easier for PrEP users to access services during the COVID-19 pandemic. The San Francisco study reported high eligibility and acceptance by PrEP users of the home blood sampling method. The study results suggest that home-collected laboratory samples for patients on PrEP are an alternative option to clinic-collected laboratory samples. The study found that 87.7% of PrEP users were delighted with the ability to complete laboratory tests without having to come to the clinic [37].

3.3.3 Home delivery of medication

PrEP medication can be sent by post or courier. They are expanding PrEP delivery options to individuals via postal or courier services to avoid unnecessary trips to healthcare facilities. These deliveries allow individuals to get regular PrEP medication without leaving home. Several studies explain that drug delivery is also helpful in reducing queuing time at the pharmacy, reducing the risk of infection during the COVID-19 pandemic, and helping speed up drug delivery for disabilities [38,39,38,40].

3.3.4 The longer stock of PrEP

Increase the stock of PrEP provided to users so that they have sufficient supply for a more extended period. These supplies help reduce the frequency of visits to health facilities and ensure continued use of PrEP. By providing sufficient supplies of PrEP for a more extended period, individuals can minimize the frequency of visits to health facilities and ensure uninterrupted continuity of PrEP use [41,42].

Identify PrEP users who have demonstrated good adherence and ensure they have sufficient supplies of PrEP for a certain period. Evaluate each individual's need for PrEP based on their dosage and usage schedule. Doctors may prescribe PrEP for extended periods, such as three to six months. This policy allows users to obtain adequate stocks without visiting the health facility regularly.

3.3.5 Online education and information

Provide educational resources and information about PrEP online. Educational media can be in the form of videos, brochures, or articles that explain the benefits, procedures, and safety of PrEP. This approach can reach individuals who need information without attending meetings or counseling in a physical location. Make short videos explaining PrEP, its benefits, how to use it, and essential information about PrEP. These videos can be uploaded on platforms like YouTube or the official PrEP program website. They create online forums or groups on social media platforms or messaging apps dedicated to discussing PrEP. This forum can allow individuals to exchange information, experiences, and support related to PrEP without meeting physically. However, other studies show that developing countries especially need digital education and good networks to support online education [43,44].

3.3.6 Collaboration and integration with COVID-19 services

Work closely with COVID-19 programs and services to ensure that PrEP remains a priority in healthcare planning and implementation during the pandemic. They are integrating PrEP services with existing COVID-19 testing services. When someone comes for a COVID-19 test, they are also given information about PrEP as part of the service provided. This education helps increase awareness and accessibility of PrEP to individuals visiting COVID-19 testing facilities and providing information about PrEP through communication channels used in disseminating information related to COVID-19, such as the official COVID-19 website, mobile application, text message, or social media. This communication channel will enable individuals seeking information about COVID-19 to obtain information about PrEP.

Develop integrated services that combine PrEP and COVID-19 services in one place or program. This integrated service allows individuals to

easily access COVID-19 and PrEP tests in the exact location, reducing access barriers and ensuring health service continuity. It could also be by working with COVID-19 programs to develop awareness campaigns covering PrEP and HIV/AIDS. These campaigns can include empowering individuals to access PrEP services, reminding them of the importance of protecting themselves from HIV/AIDS during a pandemic, and conveying messages about sexual safety and health during COVID-19 [45].

4. CONCLUSION

During the COVID-19 pandemic, various challenges faced HIV prevention programs with PrEP, such as fear of transmitting COVID-19, disrupted access to health services, disrupted PrEP supplies, and changes in priorities for medical personnel who shifted to treating COVID-19. The government has implemented various strategies: telemedicine, remote counseling, mobile laboratory services, home delivery of PrEP drugs, extending PrEP supplies, and online education and information. Collaboration and integration of PrEP services and handling COVID-19 is critical to ensuring that individuals who need PrEP continue to have access without increasing the risk of transmitting COVID-19, maintaining overall public health, and continuing HIV prevention efforts during this pandemic.

CONSENT

It is not applicable.

ETHICAL APPROVAL

It is not applicable.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Jewell BL, Mudimu E, Stover J, Ten Brink D, Phillips AN, Smith JA, et al. Potential

effects of disruption to HIV programmes in sub-Saharan Africa caused by COVID-19: results from multiple mathematical models. *Lancet HIV* [Internet]. World Health Organization. 2020;7:e629–40.

Available:[http://dx.doi.org/10.1016/S2352-3018\(20\)30211-3](http://dx.doi.org/10.1016/S2352-3018(20)30211-3)

2. Pleuhs B, Quinn KG, Walsh JL, Petroll AE, John SA. Health care provider barriers to HIV pre-exposure prophylaxis in the United States: A systematic review. *AIDS Patient Care STDS*. 2020;34:111–23.
3. WHO. WHO implementation PrEP of HIV infection module 4: Leaders. 2017;1–16.
4. Ten Brink DC, Martin-Hughes R, Minnery ME, Osborne AJ, Schmidt HMA, Dalal S, et al. Cost-effectiveness and impact of preexposure prophylaxis to prevent HIV among men who have sex with men in Asia: A modelling study. *PLoS One* [Internet]. 2022;17:1–13. Available:<http://dx.doi.org/10.1371/journal.pone.0268240>
5. Mudimu E, Peebles K, Mukandavire Z, Nightingale E, Sharma M, Medley GF, et al. Individual and community-level benefits of PrEP in western Kenya and South Africa: Implications for population prioritization of PrEP provision. *PLoS One* [Internet]. 2020;15:1–11. Available:<http://dx.doi.org/10.1371/journal.pone.0244761>
6. Shrestha R, Copenhaver M. Exploring the use of pre-exposure prophylaxis (PrEP) for HIV prevention among high-risk people who use drugs in treatment. *Front Public Heal*. 2018;6:1–9.
7. WHO. Evaluation WHO implementation tool for pre-exposure prophylaxis (PrEP) of HIV Infection. Geneva; 2018.
8. Chou R, Evans C, Hoverman A, Sun C, Dana T, Bougatsos C, et al. Preexposure prophylaxis for the prevention of HIV infection: Evidence report and systematic review for the US preventive services task force. *JAMA - J Am Med Assoc*. 2019;321:2214–30.
9. Witte SS, Filippone P, Ssewamala FM, Nabunya P, Bahar OS, Mayo-Wilson LJ, et al. PrEP acceptability and initiation among women engaged in sex work in Uganda: Implications for HIV prevention. *Lancet* [Internet]. Elsevier Ltd. 2022;44:1-10. Available:<https://doi.org/10.1016/j.eclinm.2022.101278>

10. Nhamo D, Duma SE, Ojewole EB, Chibanda D, Cowan FM. Factors motivating female sex workers to initiate pre-exposure prophylaxis for HIV prevention in Zimbabwe. *PLoS One* [Internet]. 2022;17:1-14. Available:<http://dx.doi.org/10.1371/journal.pone.0264470>
11. Sekhon M, Cartwright M, Francis JJ. Acceptability of healthcare interventions: An overview of reviews and development of a theoretical framework. *BMC Health Serv Res. BMC Health Services Research*. 2017;17:1–13.
12. Eakle R, Bourne A, Mbogua J, Mutanha N, Rees H. Exploring acceptability of oral PrEP prior to implementation among female sex workers in South Africa. *J Int AIDS Soc*. 2018;21.
13. Witte SS, Filippone P, Ssewamala FM, Nabunya P, Bahar OS, Mayo-Wilson LJ, et al. PrEP acceptability and initiation among women engaged in sex work in Uganda: Implications for HIV prevention. *eClinicalMedicine. Elsevier Ltd*. 2022;44:1-10.
14. Beckham SW, Mantsios A, Galai N, Likindikoki S, Mbwambo J, Davis W, et al. Acceptability of multiple modalities of pre-exposure prophylaxis (PrEP) among female sex workers in Tanzania: A mixed-methods study. *BMJ Open*. 2022;12:1-10.
15. Muwonge TR, Nsubuga R, Brown C, Nakyanzi A, Bagaya M, Bambia F, et al. Knowledge and barriers of PrEP delivery among diverse groups of potential PrEP users in Central Uganda. *PLoS One* [Internet]. 2020;15:1–15. Available:<http://dx.doi.org/10.1371/journal.pone.0241399>
16. Shea J, Bula A, Dunda W, Hosseinipour MC, Golin CE, Hoffman IF, et al. The drug will help protect my tomorrow: Perceptions of integrating prep into hiv prevention behaviors among female sex workers in Lilongwe, Malawi. *AIDS Educ Prev*. 2019;31:421-32.
17. Galea JT, Kinsler JJ, Salazar X, Lee SJ, Giron M, Sayles JN, et al. Acceptability of pre-exposure prophylaxis as an HIV prevention strategy: Barriers and facilitators to pre-exposure prophylaxis uptake among at-risk peruvian populations. *Int J STD AIDS*. 2011;22: 256- 62.
18. Irwan. *Etika dan perilaku kesehatan*. Jakarta: Etika dan Perilaku Kesehatan; 2020.
19. Mutua G, Sanders E, Mugo P, Anzala O, Haberer JE, Bangsberg D, et al. Safety and adherence to intermittent pre-exposure prophylaxis (PrEP) for HIV-1 in African men who have sex with men and female sex workers. *PLoS One*. 2012;7.
20. Ortblad KF, Chanda MM, Musoke DK, Ngabirano T, Mwale M, Nakitende A, et al. Acceptability of HIV self-testing to support pre-exposure prophylaxis among female sex workers in Uganda and Zambia: Results from two randomized controlled trials. *BMC Infect Dis. BMC Infectious Diseases*. 2018;18:1–8.
21. Zhang Y, Peng B, She Y, Liang H, Peng H Bin, Qian HZ, et al. Attitudes toward HIV pre-exposure prophylaxis among men who have sex with men in Western China. *AIDS Patient Care STDS*. 2013;27:137–41.
22. Amogne MD, Sanders EJ, Belihu WB, Sundewall J, Agardh A. Condom failure and pre-exposure prophylaxis use experience among female sex workers in Ethiopia: A qualitative study. *BMC Public Health* [Internet]. *BioMed Central*; 2022;22:1–10. Available:<https://doi.org/10.1186/s12889-022-13468-3>
23. Tewachew AS, Mekonnen WN, Mekuria AD, Amare YE. Determinants of opportunistic infections among hiv-positive patients on haart in debre berhan referral hospital, north shoa zone, ethiopia, 2020: A case-control study. *HIV/AIDS - Res Palliat Care*. 2021;13:337-47.
24. Sutini, Rahayu SR, Saefurrohman MZ, Al Ayubi MTA, Wijayanti H, Wandastuti AD, et al. Prevalence and determinants of opportunistic infections in HIV patients: A cross-sectional study in the city of Semarang. *Ethiop J Health Sci*. 2022; 32:809-16.
25. Bingham A, Shrestha RK, Khurana N, Jacobson EU, Farnham PG. Estimated Lifetime HIV-Related Medical Costs in the United States. *Sex Transm Dis*. 2021;48:299–304.
26. Vallejo-Torres L, García-Lorenzo B, Edney LC, Stadhouders N, Edoaka I, Castilla-Rodríguez I, et al. Are estimates of the health opportunity cost being used to draw conclusions in published cost-effectiveness analyses? A scoping review in four countries. *Appl health econ health policy*

- [Internet]. Springer International Publishing. 2022;20:337–49. Available:<https://doi.org/10.1007/s40258-021-00707-8>
27. Nichols BE, Cele R, Lekodeba N, Tukei B, Ngorima-Mabhena N, Tiam A, et al. Economic evaluation of differentiated service delivery models for HIV treatment in Lesotho: costs to providers and patients. *J Int AIDS Soc.* 2021;24:1–8.
 28. Di Ciaccio M, Villes V, Michels D. Impact of the early 2020 COVID-19 crisis and lockdown on PrEP use among men who have sex with men (MSM) in France. *Sex Transm Infect.* 2022;98:510–7.
 29. Gail R, Wilensky P, The. The COVID-19 Pandemic and the US health care workforce. *JAMA Heal Forum.* 2022;3.
 30. Fernandes DE, Ferreira PRA, Kirsztajn GM. Pre-exposure prophylaxis during the SARS-CoV-2 pandemic: can PrEP prevent COVID-19-related symptoms? *Epidemiol Infect.* 2020;148:1–5.
 31. Chan CT, Ming K, Camp C, Saberi P. Sexual Behaviors, Substance Use, and Quality of Life among Individuals Using PrEP in San Francisco during the COVID-19 pandemic shelter-in-place orders: A cross-sectional survey. *J Acquir Immune Defic Syndr.* 2022;89:E39–42.
 32. Torres TS, Hoagland B, Bezerra DRB, Garner A, Jailil EM, Coelho LE, et al. Impact of COVID-19 Pandemic on sexual minority populations in Brazil: An analysis of social/racial disparities in maintaining social distancing and a description of sexual behavior. *AIDS Behav [Internet]. Springer US;* 2021;25:73–84. Available:<https://doi.org/10.1007/s10461-020-02984-1>
 33. Koontalay A, Suksatan W, Prabsangob K, Sadang JM. Healthcare workers' burdens during the COVID-19 pandemic: A qualitative systematic review. *J Multidiscip Healthc.* 2021;14:3015–25.
 34. Al-Khateeb BF. Changing agendas and priorities of public health associations across the globe following in the era of COVID-19 pandemic-A mini-review Badr. *J Fam Med Prim Care [Internet].* 2020;9:3838–42. Available:<http://www.jfmpc.com/article.asp?issn=22494863;year=2017;volume=6;issue=1;spage=169;epage=170;aulast=Faizi>
 35. Hoagland B, Torres TS, Bezerra DRB, Geraldo K, Pimenta C, Veloso VG, et al. Telemedicine as a tool for PrEP delivery during the COVID-19 pandemic in a large HIV prevention service in Rio de Janeiro-Brazil. *Brazilian J Infect Dis [Internet]. Sociedade Brasileira de Infectologia;* 2020;24:360-4. Available:<https://doi.org/10.1016/j.bjid.2020.05.004>
 36. Hoagland B, Torres TS, Bezerra DRB, Benedetti M, Pimenta C, Veloso VG, et al. High acceptability of PrEP teleconsultation and HIV self-testing among PrEP users during the COVID-19 pandemic in Brazil. *Brazilian J Infect Dis.* 2021;25:1-5.
 37. Saberi P, Ming K, Shrestha I, Scott H, Thorson B, Liu A. Feasibility and acceptability of home-collected samples for human immunodeficiency virus preexposure prophylaxis and severe acute respiratory syndrome coronavirus 2 laboratory tests in San Francisco primary care clinics. *Open Forum Infect Dis.* 2022;9:1–7.
 38. Abu-Farha R, Alzoubi KH, Alkhawaldeh R, Itani R, Karout S, Mukattash T, et al. Home delivery of medications: Community pharmacists' perspectives on the pros and cons of the service. *Front Public Heal.* 2022;10.
 39. AlAbbasi HK, Thorakkattil SA, Mohiuddin SI, Nemr HS, Jabbour R, Al-Ghamdi F. Implementation and effectiveness of drive-through medication pick-up and home delivery services. A patient safety initiative during COVID-19 pandemic. *J Patient Saf Risk Manag.* 2021;26:179–86.
 40. Mash RJ, Schouw D, Daviaud E, Besada D, Roman D. Evaluating the implementation of home delivery of medication by community health workers during the COVID-19 pandemic in Cape Town, South Africa: a convergent mixed methods study. *BMC Health Serv Res [Internet]. BioMed Central;* 2022;22:1–11. Available:<https://doi.org/10.1186/s12913-022-07464-x>
 41. Alexander GC, Qato DM. Ensuring access to medications in the US during the COVID-19 Pandemic. *JAMA - J Am Med Assoc.* 2020;324:31–2.
 42. Badreldin HA, Atallah B. Global drug shortages due to COVID-19. *Res Soc Adm Pharm.* 2020;17:1946–9.
 43. Shrestha S, Haque S, Dawadi S, Giri RA. Preparations for and practices of online education during the Covid-19 pandemic:

- A study of Bangladesh and Nepal. Educ Inf Technol. 2022;27:243–65.
44. Selvaraj A, Radhin V, KA N, Benson N, Mathew AJ. Effect of pandemic based online education on teaching and learning system. Int J Educ Dev [Internet]. Elsevier Ltd. 2021;85:102444. Available:<https://doi.org/10.1016/j.ijedudev.2021.102444>
45. Bulstra CA, Hontelez JAC, Otto M, Stepanova A, Lamontagne E, Yakusik A, et al. Integrating HIV services and other health services: A systematic review and metaanalysis. PLoS Med; 2021.

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