

RESEARCH

Open Access



# HIV prevention at drug shops: awareness and attitudes among shop dispensers and young women about oral pre-exposure prophylaxis and the dapivirine ring in Shinyanga, Tanzania

Julia Tubert<sup>1\*</sup> , Laura Packel<sup>1</sup>, Lauren A. Hunter<sup>1</sup>, Rashid Mfaume<sup>2</sup>, Prosper Njau<sup>3,4</sup>, Angela A. Ramadhani<sup>4</sup>, Jenny X. Liu<sup>5</sup> and Sandra I. McCoy<sup>1</sup>

## Abstract

**Background:** HIV risk remains high among adolescent girls and young women (AGYW, ages 15–24) in Tanzania. Many AGYW experience stigma and provider bias at health facilities, deterring their use of HIV prevention services. Privately-owned drug shops, ubiquitous in many communities, may be an effective and accessible channel to deliver HIV prevention products to AGYW, including oral pre-exposure prophylaxis (PrEP) and the dapivirine vaginal ring.

**Methods:** In July–August 2019, we enrolled 26 drug shops in Shinyanga, Tanzania in an ongoing study to create “girl-friendly” drug shops where AGYW can access HIV self-testing and contraception. At baseline, all shop dispensers were given basic information about oral PrEP and the dapivirine ring and were asked about their interest in stocking each. During the next 3–5 months, we surveyed AGYW (n = 56) customers about their interest in oral PrEP and the ring.

**Results:** Among dispensers, the median age was 42 years and 77% were female. Overall, 42% of dispensers had heard of a medication for HIV prevention. Almost all dispensers reported some interest in stocking oral PrEP (92%) and the dapivirine ring (96%). Most (85%) reported they would provide oral PrEP to AGYW who requested it. Among AGYW customers, the median age was 17 years; 29% of AGYW were married or had a steady partner and 18% had children. Only 20% of AGYW had heard of a medication to prevent HIV, yet 64% and 43% expressed some interest in using oral PrEP and the dapivirine ring, respectively, after receiving information about the products. PrEP interest was higher among AGYW who were partnered and had children.

**Conclusions:** Despite low prior awareness of PrEP among shop dispensers and AGYW, we found high levels of interest in oral PrEP and the dapivirine ring in both groups. Community-based drug shops represent a promising strategy to make HIV prevention more accessible to AGYW.

**Keywords:** HIV prevention, Pre-exposure prophylaxis, PrEP, Young women, Sub-Saharan Africa, HIV, Tanzania, Drug shops, Long-acting PrEP, Dapivirine ring, Adolescent girls

## Background

Adolescent girls and young women (AGYW, ages 15–24) comprise 25% of new adult HIV infections in sub-Saharan Africa [1]. In many countries where pre-exposure

\*Correspondence: juliatubert@berkeley.edu

<sup>1</sup> School of Public Health, University of California, Berkeley, 2121 Berkeley Way, Berkeley, CA 94704, USA

Full list of author information is available at the end of the article



© The Author(s) 2021. This article is licensed under a Creative Commons Attribution 4.0 International License, which permits use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons licence, and indicate if changes were made. The images or other third party material in this article are included in the article's Creative Commons licence, unless indicated otherwise in a credit line to the material. If material is not included in the article's Creative Commons licence and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder. To view a copy of this licence, visit <http://creativecommons.org/licenses/by/4.0/>. The Creative Commons Public Domain Dedication waiver (<http://creativecommons.org/publicdomain/zero/1.0/>) applies to the data made available in this article, unless otherwise stated in a credit line to the data.

prophylaxis (PrEP) is available, AGYW are prioritized for PrEP outreach [2], yet early evidence demonstrates sub-optimal PrEP uptake and coverage among AGYW [3, 4]. The gap in implementation may be partially explained by the unique barriers AGYW face when accessing sexual and reproductive health (SRH) services in healthcare facilities, such as stigma and provider bias [5–9]. Shortages of workers and supplies also impede delivery of services at many facilities [10], forcing AGYW to travel longer distances at greater costs [11, 12]. Thus, the potential for PrEP to halt HIV transmission among AGYW hinges on identifying implementation models that can mitigate these pervasive access barriers.

Innovative models to improve access to PrEP through the private sector are beginning to emerge, albeit largely in the United States [13, 14]. These strategies range from pharmacies providing PrEP referrals to the provision of full PrEP services, such as Seattle's One-step PrEP program and San Francisco's Mission Wellness Pharmacy [15–19]. Along this spectrum is the distribution of PrEP starter packs by pharmacists, a model recently adopted in California [20]. While PrEP typically requires a prescription from a licensed physician, this model allows pharmacists to provide 1–2 months of pills upon proof of a negative HIV test, along with a referral for lab testing and subsequent prescriptions. While there is growing interest in implementing similar private-sector models to deliver PrEP to high-priority populations in sub-Saharan Africa, few studies have explored this potential to date [21–23].

In Tanzania, the accredited drug dispensing outlet (ADDO) program has played a key role in improving access to quality-assured pharmaceuticals via community-based retail drug shops [24–26]. Located in nearly every community, ADDOs already serve as a primary source of SRH products for AGYW and may have the potential to increase access to HIV prevention services [25, 27]. Currently, Gilead's oral PrEP pill, Truvada, is approved in Tanzania, while the vaginal dapivirine ring and generic versions of oral PrEP are pending regulatory approval [28]. In July 2020, the European Medicines Agency adopted a positive opinion on the dapivirine ring, an important step towards making the ring available in parts of sub-Saharan Africa, potentially as early as 2021 [29]. Adding these PrEP formulations to drug shop services, as they are rolled out in Tanzania, could complement existing ADDO initiatives and provide one-stop-shopping for many AGYW. With an eye toward improving access to HIV prevention technologies for AGYW, we explored the acceptability and appropriateness of PrEP distribution via privately-owned drug shops. In particular, we assessed prior knowledge of PrEP and interest in stocking/using PrEP (both oral PrEP and the forthcoming dapivirine ring) among shop dispensers and

AGYW customers, as well as dispenser willingness to provide PrEP to AGYW. Understanding knowledge and attitudes around PrEP among these stakeholders is an important step in the early exploration of ADDO-based PrEP delivery models in Tanzania.

## Methods

In July–August 2019, we recruited 26 drug shops in Shinyanga, Tanzania as part of a pilot randomized study to create “girl-friendly” drug shops where AGYW can access HIV self-testing kits and other SRH products. Shinyanga is a resource-constrained, semi-rural region with 5.1% HIV prevalence among AGYW [30]. Twenty ADDOs were randomly sampled from a government registry; three additional ADDOs and three pharmacies were purposefully sampled to increase heterogeneity in shop size and type. Drug shops were recruited in collaboration with the Municipal Pharmacist who oversees ADDOs in Shinyanga and who introduced the research team to shop owners. Eligible shops met the following criteria: (1) ADDO or pharmacy in Shinyanga, (2) owner was at least 18 years of age, and (3) owner was interested in participating in the parent study. Data collection was conducted through December 2019.

At enrollment, we interviewed the owner or a designated staff member (hereafter, “dispenser”) at each shop about shop operations and their perceptions of SRH products. Dispensers were asked if they had heard of a medicine that can prevent HIV infection (‘yes,’ ‘no,’ or ‘unsure’). Respondents were verbally given basic information about oral PrEP and the dapivirine ring. For oral PrEP, respondents were given the following information verbally: “Pre-exposure prophylaxis (also called PrEP) is medicine that a person can take to help prevent infection from HIV. It is taken in tablet form (a pill like Panadol). When taken daily, it lowers the chance of getting infected with HIV.” Similarly, respondents received the following information, verbally, about the dapivirine ring: “The dapivirine ring is a method that women can use to help prevent infection from HIV. It is a flexible ring which women can insert in the vagina. Over the course of the month, it releases a medicine that lowers the chance of getting infected with HIV. It must be replaced each month.” Dispensers were then asked about their interest in stocking each product, if they believed their customers would be interested in purchasing each product, and if they would be willing to sell oral PrEP to AGYW. Possible responses for each of these questions were ‘yes,’ ‘no,’ or ‘maybe.’

Within the subsequent 3–5 months, exit interviews were conducted during 3-h time blocks as part of the parent study to survey AGYW customers upon exit about their experiences and interactions with dispensers.

AGYW customers were eligible to participate if they were 15–24 years of age. AGYW who consented to participate completed the survey with a trained research assistant in the back room of the shop or another private location nearby. Like dispensers, AGYW were asked if they had heard of a medicine for HIV prevention ('yes', 'no', or 'unsure') and then verbally given basic information about oral PrEP and the dapivirine ring and asked if they would be interested in using each product if it became available ('yes', 'no', or 'maybe'). Food insecurity among AGYW was measured using the Household Hunger Scale, which has been validated for cross-cultural use [31].

We also assessed bivariate associations between sociodemographic characteristics and interest in PrEP among AGYW, using Kruskal–Wallis tests for continuous variables and Fisher exact tests for categorical variables. Interest in PrEP was dichotomized as some interest ('yes' or 'maybe') in at least one of the two PrEP modalities versus no interest in either product. Due to unstable estimates and low precision resulting from small sample size, we did not report multivariable results for this study.

## Results

Of 47 drug shops sampled, 27 could be contacted and met eligibility criteria; of these, 26 consented to participate. Among dispensers, the median age was 42 years (interquartile range [IQR] 29–55) and 77% were female (Table 1); most (62%) owned the shop. Overall, 42% of dispensers (95% CI 23.4–63.1%) had heard of a medication for HIV prevention (Fig. 1). After receiving verbal information on each product, 92% of dispensers (95% CI 74.9–99.1%) reported some interest in stocking oral PrEP, and 96% (95% CI 80.4–99.9%) reported some interest in the dapivirine ring. All dispensers reported some interest in stocking at least one of the two products, and most reported that they believed their customers would be interested in oral PrEP (81%; 95% CI 60.6–93.4%) and the dapivirine ring (65%; 95% CI 44.3–82.9%). Most dispensers (85%; 95% CI 65.1–95.6%) reported they would provide oral PrEP to any AGYW who requested it.

A total of 56 AGYW customers (80% of those approached) from 11 of the 26 shops agreed to participate. Among AGYW customers, the median age was 17 years (IQR 16–19); 21% (95% CI 11.6–34.4%) had completed secondary school and 61% (95% CI 46.8–73.5%) were still in school (Table 2). AGYW lived a median of 10 min away (IQR 5–20) by walking, bicycle, or motorcycle taxi from the shop where they were interviewed. About 29% of AGYW (95% CI 15.8–40.3%) were married or had a serious partner and 18% (95% CI 8.9–30.4%) had children. Most AGYW (77%; 95% CI

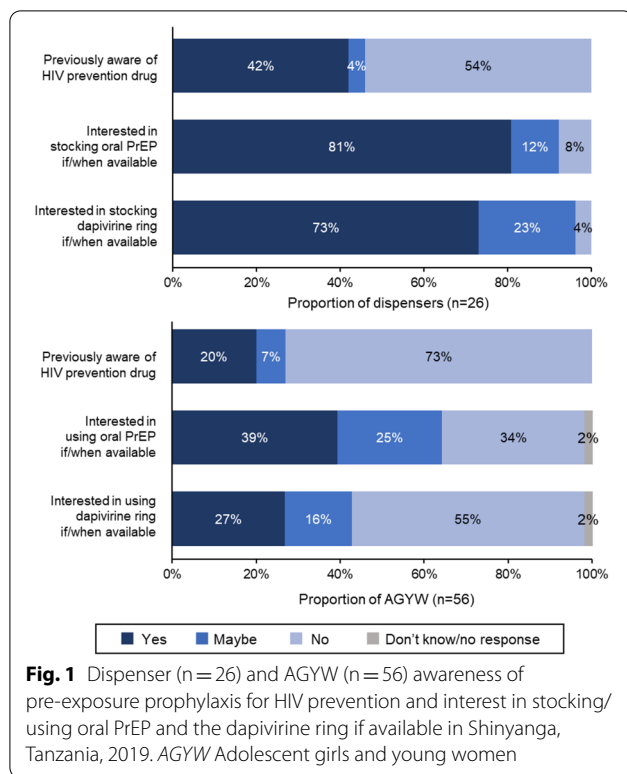
**Table 1** Sample characteristics of drug shop dispensers

Characteristics of dispensers	Dispensers (n = 26) <sup>a</sup>
Age in years, median (IQR)	42 (29–55)
Sex	
Female	20 (77%)
Male	6 (23%)
Highest education level	
Primary school	5 (19%)
Secondary school, some post-secondary education, or other certificate	13 (50%)
University degree or diploma course	8 (31%)
Position at shop	
Shop owner	16 (62%)
Shop staff	10 (38%)
Years working at a drug shop/pharmacy, median (IQR)	8.5 (5–17)
Shop location type	
Urban	20 (77%)
Peri-urban	6 (23%)
Total number of shop staff	
1	18 (69%)
2	3 (12%)
3+	5 (19%)
Estimated number of customers that day	
Total customers, median (IQR)	24 (16.5–40)
AGYW customers, median (IQR)	6 (3–10)

<sup>a</sup> All 26 dispensers reported interest in at least one form of PrEP (either oral PrEP or the dapivirine ring)

63.6–87.0%) did not have a job or way to earn money and about 20% (95% CI 10.2–32.4%) reported moderate to severe household food insecurity.

Only 20% of AGYW (95% CI 10.2–32.4%) had heard of a medication to prevent HIV, yet 70% (95% CI 55.9–81.2%) expressed some interest in using at least one of the two forms for PrEP after receiving information about the products. More specifically, 64% (95% CI 50.3–76.6%) and 43% (95% CI 29.7–56.8%) of AGYW reported some interest in using oral PrEP and the dapivirine ring, respectively. We observed higher interest in PrEP among AGYW who were partnered and had children. More specifically, 79% (95% CI 60.3–92.0%) of AGYW with partners were interested in PrEP compared to 59% (95% CI 38.8–77.6%) of single AGYW, and all AGYW with children (95% CI 66.4–100%) were interested in PrEP compared to 65% (95% CI 49.8–78.6%) of AGYW without children. Otherwise, we did not observe any significant bivariate associations



between measured AGYW characteristics and interest in using PrEP.

### Discussion

This study evaluated PrEP awareness and interest in PrEP among dispensers and AGYW customers at 26 drug shops. We found low prior awareness of PrEP among both groups. After receiving basic information on oral PrEP and the dapivirine ring, however, almost all dispensers reported some interest in stocking both products and indicated they would sell oral PrEP to AGYW. In comparison, a study of healthcare providers in Tanzania found that only 61% were willing to prescribe PrEP to AGYW [32]. However, shops in our sample were participating in a parent study focused on HIV prevention and SRH among AGYW, which likely influenced dispensers' responses. Furthermore, willingness to provide PrEP to AGYW in the aforementioned study of facility-based providers was defined as willing to prescribe for all five AGYW sub-groups listed in the survey (e.g., AGYW in sero-discordant relationships, AGYW who exchange sex for money etc.), whereas we asked about willingness to provide PrEP to AGYW in general.

Compared to dispensers, we found lower, yet still considerable, levels of interest in PrEP among AGYW. Comparable interest levels have been found among AGYW elsewhere in sub-Saharan Africa, who—like AGYW in

this study—have also reported lower interest in the dapivirine ring than in oral PrEP [33–35]. This may be partially explained by the lack of familiarity with vaginal ring contraceptives in the region [34]. Because the dapivirine ring is not currently available in Tanzania, reported interest in the ring is hypothetical. Nevertheless, this work is both timely and necessary to understand appropriate implementation models for the ring's eventual rollout, the timeline of which has been accelerated by the European Medicines Agency's recent positive benefit-risk opinion on the ring [36]. The values and preferences of women, in conjunction with safety and efficacy evidence, will be of important consideration as regulatory decisions and guidelines for the ring are developed [36].

Our findings make several key contributions. While ADDOs have been utilized to improve access to many pharmaceutical services in Tanzania and other low- and middle-income countries [25, 26], this is the first study, to our knowledge, that explores the potential of drug shops to expand PrEP access in these settings. Shinyanga, in particular, is a valuable research setting, as ADDO-based provision of PrEP would likely have greater impact in rural areas with limited healthcare facilities and many other access barriers. Although AGYW in this study had access to HIV self-testing at participating shops through the parent study, only 20% were aware of medication to prevent HIV. As HIV self-test kits are introduced to new markets, HIV prevention efforts could be amplified if complemented with additional, accessible prevention services. Adding HIV testing and PrEP services to drug shops would be a logical fit, creating one-stop-shops to meet AGYW's SRH needs.

This study has important limitations. Small sample sizes may have limited the power needed to detect associations with PrEP interest. Our sample included AGYW from only 11 of the 26 shops, which may be explained by low AGYW patronage at the remaining shops. Additionally, participating dispensers had consented to our parent study focused on AGYW SRH, which may have influenced their responses. However, the dispenser survey was administered at enrollment, prior to implementation of the intervention, thus limiting potential effects of the intervention on our findings. Nevertheless, if PrEP is to be sold at drug shops, it would be desirable to seek out 'AGYW-friendly' dispensers. HIV-related stigma and reliance on interviewer-administered questionnaires may have also influenced verbally self-reported PrEP awareness and interest levels. Finally, we did not collect data on AGYW's HIV status or whether they were sexually active, which may have provided insight into their actual and perceived HIV risk and subsequent interest in PrEP.

**Table 2** Sample characteristics of adolescent girls and young women (AGYW) customers

Characteristics of AGYW customers	All AGYW (n = 56)	By interest in PrEP (either form) <sup>a</sup>		p value <sup>b</sup>
		Some interest (n = 39)	No interest (n = 16)	
Age in years, median (IQR)	17 (16–19)	17 (16–21)	16 (15.5–17)	0.053
Currently in school				0.072
Yes	34 (61%)	21 (54%)	13 (81%)	
No	22 (39%)	18 (46%)	3 (19%)	
Highest/current education level				0.438
Primary school or no level completed	7 (13%)	6 (15%)	1 (6%)	
Some secondary school	37 (66%)	24 (62%)	13 (81%)	
Secondary school	12 (21%)	9 (23%)	2 (12%)	
Have job or earn money				0.304
Yes	13 (23%)	11 (28%)	2 (12%)	
No	43 (77%)	28 (72%)	14 (88%)	
Relationship status				<b>0.047</b>
Single	27 (48%)	16 (41%)	11 (69%)	
Married or steady partner	16 (29%)	14 (36%)	1 (6%)	
Casual or multiple partner(s)	13 (23%)	9 (23%)	4 (25%)	
Have children				<b>0.046</b>
Yes	10 (18%)	9 (23%)	0 (0%)	
No	46 (82%)	30 (77%)	16 (100%)	
Household food insecurity				1.000
Little to no household hunger	45 (80%)	31 (79%)	13 (81%)	
Moderate/severe household hunger	11 (20%)	8 (21%)	3 (19%)	
Distance to shop in minutes, median (IQR)	10 (5–20)	12.5 (7.5–17.5)	10 (5–25)	0.896
Reason for shop visit				0.519
SRH product(s)	14 (25%)	9 (23%)	5 (31%)	
Other	42 (75%)	30 (77%)	11 (69%)	
Previously aware of HIV prevention drugs				0.478
Yes	11 (20%)	9 (23%)	2 (13%)	
No or unsure	45 (80%)	30 (77%)	14 (88%)	

<sup>a</sup> AGYW characteristics are stratified by some interest or no interest in at least one form of PrEP (either oral PrEP or the dapivirine ring). One AGYW customer responded “don’t know/no response” to the questions about interest in using oral PrEP and the dapivirine ring

<sup>b</sup> For categorical variables, p values from Fisher exact tests are presented. For continuous variables, p values from Kruskal–Wallis tests are presented. Significant associations (at  $\alpha = 0.05$ ) are shown in bold

## Conclusions

Recent studies have demonstrated promising models of private-sector PrEP delivery, yet there is limited research exploring this potential in low- and middle-income countries with high HIV prevalence [23, 37]. Our findings suggest the potential for drug shops to deliver PrEP to high-priority populations in Tanzania. Additional work is needed to assess the feasibility and effectiveness of this model and determine the role of drug shops in PrEP provision within the larger healthcare system. While we focused on oral PrEP and the dapivirine ring, drug-shop-based models could be extended to other forthcoming PrEP formulations (i.e., long-acting injectable PrEP, particularly if sold for self-administration). Additional training for dispensers would be needed to ensure PrEP

literacy and address stigma around HIV and AGYW sexuality while complementary measures to increase consumer awareness of PrEP are developed. Despite these implementation challenges, privately-owned drug shops are uniquely positioned to reach AGYW and offer accessible, community-based HIV prevention services.

## Abbreviations

ADDO: Accredited drug dispensing outlet; AGYW: Adolescent girls and young women; PrEP: Pre-exposure prophylaxis; SRH: Sexual and reproductive health.

## Acknowledgements

The authors gratefully acknowledge Ms. Moza Chitela, Ms. Atuganile Kalinjila, Ms. Agatha Mnyippembe, Mr. Kassim Hassan, Ms. Janeth Msasa, Dr. Sue Napierala, Dr. Nancy Padian, Dr. Ntuli Kapologwe, Dr. Elizabeth Shekalaghe, Dr. Betty Shayo, Mr. Godfrey Ngonela, the Shinyanga Regional Health

Management Team, and the Pharmacy Council of Tanzania for their contributions to this study.

#### Authors' contributions

Study concept, design, and implementation: LH, SM, JL, PN, RM, and AR. Data analysis: JT. Preparation of first draft: JT and LP. Conceptual advice and critical revision of the manuscript: SM, JL, LH, and LP. All authors have read and approved the final manuscript.

#### Funding

This work was supported by the National Institute of Mental Health (Liu/McCoy, R34MH116804).

#### Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

#### Declarations

##### Ethics approval and consent to participate

This study was approved by the Tanzanian National Institute of Medical Research and the Institutional Review Board (IRB) at the University of California (UC) San Francisco, with the IRB at UC Berkeley in reliance.

##### Consent for publication

Not applicable.

##### Competing interests

The authors declare no competing interests.

##### Author details

<sup>1</sup>School of Public Health, University of California, Berkeley, 2121 Berkeley Way, Berkeley, CA 94704, USA. <sup>2</sup>Shinyanga Regional Medical Office, Shinyanga, Tanzania. <sup>3</sup>Health for a Prosperous Nation, Dar es Salaam, Tanzania. <sup>4</sup>National AIDS Control Programme, Ministry of Health, Community Development, Gender, Elderly, and Children, Dar es Salaam, Tanzania. <sup>5</sup>Institute for Health and Aging, Bixby Center for Global Reproductive Health, University of California, San Francisco, San Francisco, CA, USA.

Received: 4 December 2020 Accepted: 8 April 2021

Published online: 26 April 2021

#### References

- The Henry J. Kaiser Family Foundation. The Global HIV/AIDS Epidemic. The Henry J. Kaiser Family Foundation. 2019. <https://www.kff.org/global-health-policy/fact-sheet/the-global-hiv-aids-epidemic/>. Accessed 8 Feb 2020.
- Saul J, Bachman G, Allen S, Toiv NF, Cooney C, Beamon T. The DREAMS core package of interventions: a comprehensive approach to preventing HIV among adolescent girls and young women. *PLoS One*. 2018;13(12):e0208167.
- Camlin CS, Koss CA, Getahun M, Owino L, Itiakorit H, Akatukwasa C, et al. Understanding demand for PrEP and early experiences of PrEP Use among young adults in rural Kenya and Uganda: a qualitative study. *AIDS Behav*. 2020. <https://doi.org/10.1007/s10461-020-02780-x>.
- Dunbar MS, Kripke K, Haberer J, Castor D, Dalal S, Mukoma W, et al. Understanding and measuring uptake and coverage of oral pre-exposure prophylaxis delivery among adolescent girls and young women in sub-Saharan Africa. *Sex Health*. 2018;15(6):513–21. <https://www.publish.csiro.au/sh/SH18061>. Accessed 6 Jun 2019.
- Nalwadda G, Mirembe F, Tumwesigye NM, Byamugisha J, Fazelid E. Constraints and prospects for contraceptive service provision to young people in Uganda: providers' perspectives. *BMC Health Serv Res*. 2011;11:220.
- Sidze EM, Lardoux S, Speizer IS, Faye CM, Mutua MM, Badji F. Young women's access to and use of contraceptives: the role of providers' restrictions in urban Senegal. *Int Perspect Sex Reprod Health*. 2014;40(4):176–83.
- Tumlinson K, Okigbo CC, Speizer IS. Provider barriers to family planning access in urban Kenya. *Contraception*. 2015;92(2):143–51.
- Wood K, Jewkes R. Blood blockages and scolding nurses: barriers to adolescent contraceptive use in South Africa. *Reprod Health Matters*. 2006;14(27):109–18.
- Minnis AM, Mavedzenge SN, Luecke E, Dehlendorf C. Provider counseling to young women seeking family planning services. *Perspect Sex Reprod Health*. 2014;46(4):223–31.
- Ministry of Health and Social Welfare (MOHSW). Tanzania service availability and readiness assessment (SARA) 2012. Dar es Salaam, Tanzania: Ifakara Health Institute. 2013. [http://ihi.eprints.org/2448/1/SARA\\_2012\\_Report.pdf](http://ihi.eprints.org/2448/1/SARA_2012_Report.pdf). Accessed 2016 Nov 30.
- Govindasamy D, Ford N, Kranzer K. Risk factors, barriers and facilitators for linkage to antiretroviral therapy care: a systematic review. *AIDS*. 2012;26(16):2059–67.
- Reynolds HW, Wong EL, Tucker H. Adolescents' use of maternal and child health services in developing countries. *Int Fam Plan Perspect*. 2006;32(1):6–16.
- Myers JE, Farhat D, Guzman A, Arya V. Pharmacists in HIV prevention: an untapped potential. *Am J Public Health*. 2019;109(6):859–61.
- Farmer EK, Koren DE, Cha A, Grossman K, Cates DW. The pharmacist's expanding role in HIV pre-exposure prophylaxis. *AIDS Patient Care STDS*. 2019;33(5):207–13.
- Havens JP, Scarsi KK, Sayles H, Klepser DG, Swindells S, Bares SH. Acceptability and feasibility of a pharmacist-led human immunodeficiency virus pre-exposure prophylaxis program in the Midwestern United States. In: open forum infectious diseases. Oxford: US; 2019. p. 365.
- Ryan K, Lewis J, Sanchez D, Anderson B, Mercier R-C. 1293. The next step in PrEP: evaluating outcomes of a pharmacist-run HIV Pre-Exposure Prophylaxis (PrEP) Clinic. In: open forum infectious diseases. Oxford University Press: US; 2018. p. S395–S395.
- Lopez MI, Cocohoba J, Cohen SE, Trainor N, Levy MM, Dong BJ. Implementation of pre-exposure prophylaxis at a community pharmacy through a collaborative practice agreement with San Francisco Department of Public Health. *J Am Pharm Assoc*. 2020;60(1):138–44.
- Tung EL, Thomas A, Eichner A, Shalit P. Implementation of a community pharmacy-based pre-exposure prophylaxis service: a novel model for pre-exposure prophylaxis care. *Sex health*. 2018;15(6):556–61.
- Lopez MI, Cocohoba J, Cohen SE, Trainor N, Levy MM, Dong BJ. Implementation of pre-exposure prophylaxis at a community pharmacy through a collaborative practice agreement with San Francisco Department of Public Health. *J Am Pharm Assoc*. 2020;60(1):138–44.
- Rosenberg J. California becomes first state to make HIV prevention medication accessible without a prescription. *Am J Manag Care Newsroom*. 2019. <https://www.ajmc.com/newsroom/california-becomes-first-state-to-make-hiv-prevention-medication-accessible-without-a-prescription>. Accessed 25 Feb 2020.
- MacDonald V, Callahan S, Basirika R, Ganesan R. Feasibility of private sector delivery of pre-exposure prophylaxis in Windhoek, Namibia. Sustaining health outcomes through the Private Sector Plus Project, Abt Associates Inc; p. 34.
- Irungu EM, Baeten JM. PrEP rollout in Africa: status and opportunity. *Nature Medicine*. 2020;26(5):655–64. <https://www.nature.com/articles/s41591-020-0872-x>. Accessed 25 Aug 2020.
- Assessment of opportunities to deliver oral PrEP for women through private sector health care AVAC. 2018. <https://www.avac.org/resource/assessment-opportunities-deliver-oral-prep-women-through-private-sector-health-care>. Accessed 8 Feb 2020.
- Pharmacy Council. Kitabu cha mafunzo kwa watoa dawa katika maduka ya dawa muhimu [Book of training for drug suppliers in ADDOs]. 1st ed. Dar es Salaam: Ministry of Health and Social Welfare; 2012.
- Rutta E, Senauer K, Johnson K, Adeya G, Mbwasiri R, Liana J, et al. Creating a new class of pharmaceutical services provider for underserved areas: the Tanzania accredited drug dispensing outlet experience. *Prog Community Health Partnersh*. 2009;3(2):145–53.
- Embrey M, Vialle-Valentin C, Dillip A, Kihyo B, Mbwasiri R, Semali IA, et al. Understanding the role of accredited drug dispensing outlets in Tanzania's health system. *PLoS ONE*. 2016;11(11):e0164332.
- Dusabe J, Mchome Z, Nnko S, Changalucha J, Obasi A. "There are bugs in condoms": Tanzanian close-to-community providers' ability to offer

- effective adolescent reproductive health services. *J Fam Plann Reprod Health Care*. 2015;41(1):e2.
28. Tanzania. PrEPWatch. <https://www.prepwatch.org/country/tanzania/>. Accessed 25 Feb 2020.
  29. Barton-Knott S. UNAIDS is hopeful that a new long-acting HIV prevention option will soon become available for women in sub-Saharan Africa. UNAIDS. 2020. [https://www.unaids.org/en/resources/presscentre/press-releaseandstatementarchive/2020/july/20200728\\_dapivirine](https://www.unaids.org/en/resources/presscentre/press-releaseandstatementarchive/2020/july/20200728_dapivirine). Accessed 25 Aug 2020.
  30. Tanzania Commission for AIDS (TACAIDS), Zanzibar AIDS Commission (ZAC), National Bureau of Statistics, (NBS), Office of the Chief Government Statistician (OCGS), and ICF International. Tanzania HIV/AIDS and Malaria Indicator Survey 2011–12: key findings. <https://www.dhsprogram.com/pubs/pdf/SR196/SR196.pdf>. Dar es Salaam: Tanzania; 2013.
  31. Household Hunger Scale (HHS): indicator definition and measurement guide. Food and nutrition technical assistance III project (FANTA). <https://www.fantaproject.org/monitoring-and-evaluation/household-hunger-scale-hhs>. Accessed 4 Mar 2020.
  32. Pilgrim N, Jani N, Mathur S, Kahabuka C, Saria V, Makyao N, et al. Provider perspectives on PrEP for adolescent girls and young women in Tanzania: the role of provider biases and quality of care. *PLOS One*. 2018;13(4):e0196280. <https://doi.org/10.1371/journal.pone.0196280>.
  33. Harling G, Muya A, Ortblad KF, Mashasi I, Dambach P, Ulenga N, et al. HIV risk and pre-exposure prophylaxis interest among female bar workers in Dar es Salaam: cross-sectional survey. *BMJ Open* 1;9(3):e023272. <http://bmjopen.bmj.com/content/9/3/e023272.abstract>. 2019.
  34. 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*. 2018;18(1):503. <https://doi.org/10.1186/s12879-018-3415-z>.
  35. Population Council. Introducing oral pre-exposure prophylaxis to adolescent girls and young women in Tanzania: overview of findings from implementation science research Washington, D.C.: Population Council. 2017. [https://knowledgecommons.popcouncil.org/departments\\_sbsr-hiv/171](https://knowledgecommons.popcouncil.org/departments_sbsr-hiv/171). Accessed 8 Feb 2020.
  36. World Health Organization. European Medicines Agency (EMA) approval of the dapivirine ring for HIV prevention for women in high HIV burden settings. 2020. [https://www.who.int/news-room/detail/24-07-2020-european-medicines-agency-\(ema\)-approval-of-the-dapivirine-ring-for-hiv-prevention-for-women-in-high-hiv-burden-settings](https://www.who.int/news-room/detail/24-07-2020-european-medicines-agency-(ema)-approval-of-the-dapivirine-ring-for-hiv-prevention-for-women-in-high-hiv-burden-settings). Accessed 29 Aug 2020.
  37. Tung EL, Thomas A, Eichner A, Shalit P. Implementation of a community pharmacy-based pre-exposure prophylaxis service: a novel model for pre-exposure prophylaxis care. *Sex Health*. 2018;15(6):556–61.

### Publisher's Note

Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Ready to submit your research? Choose BMC and benefit from:

- fast, convenient online submission
- thorough peer review by experienced researchers in your field
- rapid publication on acceptance
- support for research data, including large and complex data types
- gold Open Access which fosters wider collaboration and increased citations
- maximum visibility for your research: over 100M website views per year

At BMC, research is always in progress.

Learn more [biomedcentral.com/submissions](https://biomedcentral.com/submissions)

