



Preferences for Pre-exposure Prophylaxis Service Delivery Among Female Sex Workers in Malawi: A Discrete Choice Experiment

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Abstract

Female sex workers (FSW) in Malawi have among the highest HIV prevalence estimates worldwide. Daily oral pre-exposure prophylaxis (PrEP) is an effective HIV prevention method, yet preferences for PrEP delivery among FSW are lacking. Eight focus group discussions, a literature review, and cognitive interviews were conducted to identify modifiable PrEP delivery attributes and inform discrete-choice experiment (DCE) development for FSW in Lilongwe. Enrolled FSW received an interviewer-assisted DCE. Data were analyzed using mixed logit regression. Dispensing location was most preferred, followed by the provision of additional services. Women preferred receiving PrEP at family planning clinics or non-governmental organization run drop-in centers. Cervical cancer screening was the most preferred additional service, while pregnancy testing and partner risk reduction counseling were less valued. This study was the first study to examine PrEP delivery preferences in Malawi using DCE—a powerful elicitation tool to apply to other key populations at risk for HIV.

Keywords Pre-exposure prophylaxis · Sex workers · Women · Africa

Introduction

Despite over three decades of targeted HIV prevention efforts, female sex workers (FSW) globally remain disproportionately at risk for HIV [1–7]. The prevalence of HIV among FSW in sub-Saharan Africa is 37%, with Malawi

having the highest burden of HIV among FSW, reaching approximately 70% [2, 7]. HIV prevention efforts for FSW have primarily focused on the prevention of heterosexual transmission through expanding voluntary HIV testing and counseling, condom promotion and distribution, and sexually transmitted infections management [8]. Given the high risk of HIV acquisition, national-level HIV prevention efforts need to be more successful at protecting FSW from HIV [9].

Pre-exposure prophylaxis (PrEP) is an effective method to prevent heterosexual HIV transmission [10, 11]. PrEP was efficacious in trials that have included women who

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reported exchanging sex for money and additional HIV sexual risk behaviors [12–14]. Among trials where PrEP was ineffective, lack of adherence to PrEP was associated with HIV acquisition among women [15, 16]. PrEP demonstration projects identified that uptake is generally high when provided with intensive support for initiation and adherence [17]. As PrEP becomes available as part of national HIV programs, these additional services may not be readily available leading to potentially low uptake due to lack of awareness, willingness, or delivery methods that are not optimized for those most-at-risk, such as FSW.

The attributes that affect women's decisions to initiate and their abilities to adhere to PrEP among FSW remain largely unknown. While studies of attributes important for daily oral PrEP uptake have been studied in other key populations, no studies have been conducted among FSW. FSW face different or additional sociocultural challenges that likely affect PrEP uptake such as travel, risk reduction counseling, male partner or social supporter engagement, and stigma and discrimination [18–23]. The Malawian law does not explicitly criminalize sex work; however, “the keeping of brothels” and “living on the earnings of prostitution or influencing others to engage in prostitution” is illegal [9]. Law enforcers often perform night raids to arrest persons loitering or soliciting in entertainment and public places, and FSW are most commonly arrested. Given the stigma and discrimination FSW face in Malawi, attributes of PrEP delivery that may influence FSW's likelihood of using PrEP should be identified to inform implementation strategies for improving PrEP uptake.

Evaluations must be conducted to identify PrEP delivery attributes that will most influence decision-making around the uptake of PrEP. The discrete choice experiments (DCE) method is grounded in the economic theory of utility maximization and can help identify key modifiable attributes of PrEP delivery by presenting end-users, such as FSW, with various combinations of these attributes and asking them to choose their preferred alternatives or levels [24–27]. DCE data are analyzed to estimate the relative value individuals placed on a medical intervention's attributes and determine what combination of attributes are expected to most influence decision-making and uptake strategies [28, 29]. Prior DCE among FSW have examined preferences for experimental modalities of PrEP, including long-acting injectables and vaginal rings, [30–32] but to the best of our knowledge, none have investigated preferences for daily oral PrEP delivery strategies.

We conducted the first comprehensive assessment of preferences of PrEP delivery among HIV-uninfected FSW in Lilongwe, Malawi. We used the DCE methodology, which included formative qualitative methods to inform the conceptualization and development of an attribute list

for PrEP delivery. We also describe FSW's awareness and willingness to use PrEP to inform future uptake strategies.

Methods

Ethics

The research protocol, qualitative and cognitive interview guides, survey, including DCE, and consent forms were reviewed and approved by the Non-Biomedical Institutional Review Board at the University of North Carolina and the Malawi Ministry of Health and Population National Health Sciences Research Committee. All participants provided written informed consent. All study-related activities were conducted in a safe and private location.

Study Setting and Population

This study was conducted in Lilongwe, which is within the central region of Malawi. In 2011, there were an estimated 3500 FSW in Lilongwe [9]. FSW were found working at bars, bottle stores, and guesthouses, with nearly 40% between 20 and 24 years of age, approximately 60% reporting attending primary school, and 98% were born in Malawi, comparable to the final study population of FSW [9]. The study population included FSW, defined per the Family Planning Association of Malawi (FPAM) as someone “who had received money in exchange for sex either regularly or occasionally up to 12 months prior to the date of survey”, [9] who were at least 18 years of age and able to speak English or Chichewa, the predominant local language, and HIV seronegative. HIV status was determined by documented HIV test results within the prior 3 months or HIV rapid test results on the day of survey administration.

Development of the Discrete Choice Experiment

DCE development was informed by a review of prior literature on PrEP delivery and uptake, especially among FSW in low resource settings, followed by focus group discussions (FGDs) and cognitive interviewing with FSW [12, 20, 33, 34]. During November and December 2016, eight FGDs with a total of 44 FSW were conducted to identify key delivery attributes that would influence PrEP uptake and develop an attribute list. FSW were recruited by peer educators at venues where women are known to meet and solicit clients. FGDs were stratified by age and if FSW lived at the venue or elsewhere. The semi-structured FGD guide covered the following topics: barriers and facilitators for accessing HIV prevention services, awareness and willingness for PrEP, and preferences for characteristics of PrEP delivery, such as location, time spent obtaining PrEP, and provision

of additional services. The guide also explored preferences for various PrEP modalities, including event-driven or “on-demand”, long-acting injectables, and vaginal ring. FGDs also included formal elicitation techniques, including a free listing of potential attributes and levels and ranking of derived attribute domains.

FGDs were audio-recorded, transcribed, and translated from Chichewa to English. The qualitative research manager in Malawi verified the accuracy of each FGD’s translation and transcription. Summary notes were written within 24 h after the FGD took place to document impressions, key discussion points, and lessons learned. The research team held debriefs after each completed FGD. An initial codebook was developed based on preliminary themes and attributes identified during initial transcript reviews, FGD summaries written by the facilitator, and FGD guide. The team conducted a content and thematic analysis [35]. QRS NVivo11 was used to manage the data during coding of the transcripts. Two coders independently applied to each transcript a common codebook that was initially based on conceptual attributes identified in the literature review. Codes and definitions were revised as additional attributes emerged.

The research team reviewed preliminary results from the FGD, discussed the relevance of plausible attributes and levels, and developed the final list of attributes, levels, and images. Cognitive interviews were conducted with 5 FSW to confirm acceptability of the final attributes and graphics, comprehension of choice tasks, and FSW’s abilities to make trade-offs. Within 24 h of each cognitive interview, the interviewer wrote detailed summary notes and debriefed with the rest of the research team to review problematic areas and make revisions as appropriate. FSW involved in the formative FGDs and cognitive interviews were excluded from participating in the DCE survey.

Sawtooth software (version 8; Sequim, WA) was used to create a statistically efficient and balanced fractional factorial design of the DCE, following common DCE practices [36–38]. Previous work among Malawian women demonstrated that 16 choice cards were too burdensome, while nine cards with two scenario descriptions and images of the attribute levels on each reduced cognitive burden and was feasible [39]. For this study, binary choice sets were constructed so that participants chose between two alternatives, “Setting A” and “Setting B” (Fig. 1).

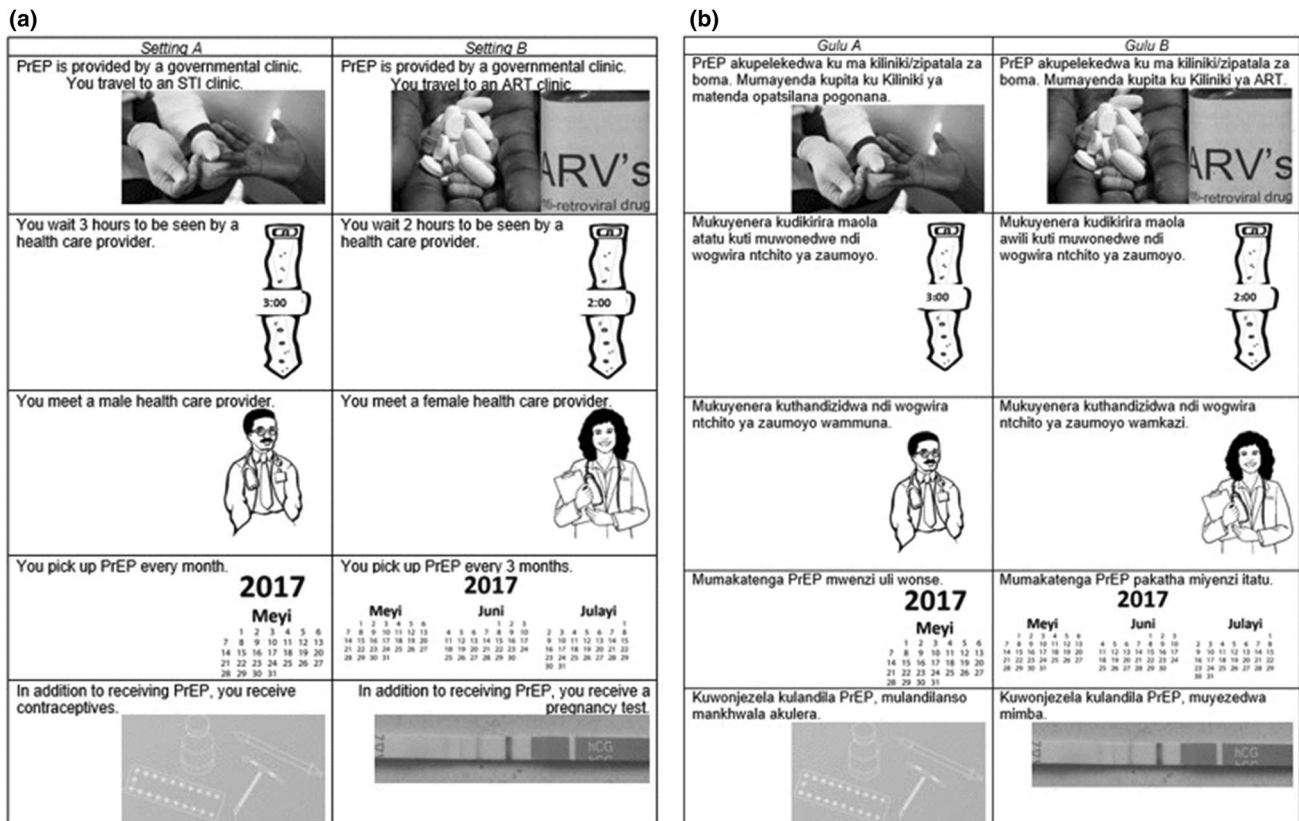


Fig. 1 Sample choice task. Choice task shown to participants during presentation of the discrete choice experiment, in English (a) and Chichewa (b)

The final full DCE design included 64 choice questions that were divided into eight blocks of eight questions. Using these blocks of questions, each respondent then would be randomly assigned to one block of 8 DCE questions. DCE sample size estimates are based mainly on rules of thumb, typically with a minimum sample size of 100 participants per subset [36, 40]. A sample size of at least 150 HIV-negative FSW (one subset) provided a balance of feasibility and timeliness of data collection.

Survey Administration

In June to August 2017, FSW were recruited and enrolled from hotspots of geographic clusters of venues where women were known to meet and solicit clients, in Lilongwe district identified in the 2016 Priorities for Local AIDS Control Efforts (PLACE) [41]. A total of 16 “hotspots” were purposively selected to provide a balance of feasibility and timeliness of data collection for this study. An outreach team was developed and included trained HIV testing counselors, interviewers, and a FSW program coordinator from FPAM. The outreach team visited the hotspots in random order and if needed, received permission to recruit and enroll female participants from venue owners and a peer FSW at venues within hotspots. Women within the hotspot were informed of the study objectives and procedures. A total of 242 women were screened, with 169 determined eligible, of which 153 provided consent and enrolled.

Trained interviewers administered a structured behavioral survey that accompanied the DCE to all consenting FSW to obtain demographics, sexual risk behaviors, and PrEP awareness and willingness. The survey was translated from English to Chichewa, the predominant language in Malawi, and back-translated. The survey was available in both English and Chichewa. All responses were entered into Open Data Kit Collect (Open Data Kit software; <https://opendatakit.org>) on tablets, and data were uploaded daily. Of the 153 enrolled, three were excluded who did not have complete data. The final study sample included 150 FSW.

Statistical Analysis

Sociodemographics, sex work characteristics, awareness, and willingness to use PrEP were examined using conventional descriptive statistics. DCE choice data were analyzed in Stata 14.1 (StataCorp, 15.0) using mixed logit regression to evaluate preferences for each PrEP delivery attribute. Mean level utilities and relative importance, in which higher numbers indicate higher value, between least preferred and most preferred within attributes were also calculated across all respondents.

Results

Qualitative Findings for DCE Development

The median age of participants was 24 (interquartile range 22–26). All participants were born in Malawi, except one who was born in Mozambique. The majority of FSW who participated in the FGD were unaware of PrEP as a prevention method. Most FSW identified the need for additional protection against STIs and pregnancy but felt PrEP would be useful to provide protection for when clients refused to wear condoms. Several themes emerged around attributes related to PrEP delivery, particularly about establishing convenient options for PrEP delivery that accounted for the unique daily lives of FSW. Many women felt receiving PrEP from family planning or HIV testing clinics would be ideal, as they were already seeking services within these clinics. Some women also discussed desires to have PrEP services come to them. Indeed, one woman explained her preferences for mobile outreach services:

It is like mobile clinics can be done by any health facility. These services providers of PrEP, they should try to bring the services closer to where sex workers are staying.

Similarly, women expressed the need to minimize the amount of time they spent at a clinic to receive PrEP. Women acknowledged their competing responsibilities of chores, work, and rest, making it challenging to spend time waiting and attending clinics to receive PrEP. Often, an hour was suggested as a maximum amount of time spent at a clinic; however, some felt an hour would not provide enough time for additional counseling that may be needed.

We can say 1 hour, but sometimes when we go there, we are supposed to wait, and there are counseling sessions on how you can use PrEP so I think 1 hour cannot be enough.

Further attributes that were discussed included the gender of healthcare providers, the frequency of receiving of PrEP, and the integration of additional services. Women emphasized the need to provide enhanced sexual and reproductive health services, such as family planning and STI testing. Several FSW also suggested including cervical cancer screening along with HIV/STI prevention counseling and testing when initiating PrEP. Across all the focus groups, women generally ranked location for receiving PrEP and the provision of additional services as the most important attributes that would influence their PrEP uptake.

After reviewing the FGD, the research team discussed the feasibility of incorporating emerging themes for

attributes for PrEP delivery. The final list of attributes and levels were narrowed to reduce the cognitive burden and reflect potential PrEP delivery scenarios women may experience. For example, experimental modalities that are not recommended by the World Health Organization (WHO) [42], were excluded from the final list of attributes as the local government and policymakers in Malawi were initiating discussions for the provision of daily oral PrEP within Malawi. Other attributes that were considered but ultimately excluded were the frequency of pick up (weekly, monthly), travel time by foot (< 1-h, 1 h, 2 h), and frequency of HIV testing (monthly, every 3 months, every 6 months). Final attributes included dispensing location (STI clinic, family planning clinic, ART clinic, NGO-run drop-in center, NGO-run mobile outreach), clinic wait time (1 h, 2 h, 3 h), provider gender (male or female), frequency of pick-up (1 month, 2 months, or 3 months), and provision of additional services (risk counseling, cervical cancer screening, pregnancy testing, or contraceptives).

Cognitive testing among FSW suggested that eight choice cards with two scenarios and graphics of attribute levels on each and binary choice format were feasible and appropriate. Women felt that the images developed improved their understanding of each scenario rather than being read each scenario aloud by the interviewer. Women did not note any necessary changes to the images developed for cognitive interviewing and felt they accurately capture the attribute levels.

Survey Sample Characteristics

Among those enrolled, the median age was 23 (IQR 21–27). Thirty-nine percent completed some secondary school, and 37% completed some primary school (Table 1). Two-thirds (66%) reported being separated, divorced, or widowed. Nearly half (45%) reported living in a bar or bottle shop, while only 25% reported living in a private house. Fifty-seven percent reported inconsistent condom use with a paying client in the prior 7 days, and over half (53%) reported ever having a client who demanded not using a condom during vaginal sex.

PrEP Awareness and Willingness

Over three quarters (79%) reported being unaware of PrEP prior to the study (Table 2). Nearly all women indicated being very willing to use PrEP (96%) and take PrEP daily (97%), if available in Malawi. Approximately 70% reported they would be extremely likely or likely to remember to take PrEP daily. Ninety percent reported being very willing to disclose to others that they were using PrEP.

Table 1 Sociodemographics and sex work characteristics of female sex workers in Lilongwe, Malawi

	Total population (n = 150)	
	n	(%)
Age (years)		
18–24	90	(60)
25–29	42	[28]
≥ 30	18	[12]
Nationality		
Malawian	147	(98)
Other	3	[2]
Education		
Never attended school	3	[2]
Some primary	55	[37]
Completed primary	28	[18]
Some secondary	58	[39]
Completed secondary	6	[4]
Marital status		
Never married	34	[23]
Married (legal or traditional) or co-habiting	17	[11]
Separated, divorced, or widowed	99	(66)
Housing ^a		
Private house	38	[25]
Bar or Bottle shop	67	[45]
Guesthouse or hotel	43	[29]
Number of pregnancies		
0	11	[7]
1	49	[33]
≥ 2	90	(60)
Location for soliciting clients ^a		
Bar or bottle shop	128	(85)
Other	19	[13]
Condom use with clients in past 7 days ^a		
Inconsistent	57	[38]
Consistent	92	(61)
Ever had a client demand not using a condom during vaginal sex ^a		
No	70	[47]
Yes	80	[53]

^aMissing data due to not knowing or refused to answer: housing, n = 2; location for soliciting clients, n = 3; condom use with clients in past 7 days, n = 1

PrEP Delivery Preferences

Dispensing location was the most valued attribute (relative utility or $\beta = 0.54$; 95% CI 0.50, 0.58) for PrEP delivery (Fig. 2), followed by the provision of additional services ($\beta = 0.36$; 95% CI 0.31, 0.41). Provider gender ($\beta = 0.25$; 95% CI 0.21, 0.29) was more important than frequency of

Table 2 PrEP awareness and willingness among female sex workers in Lilongwe, Malawi

	Total population (n = 150) n (%)
PrEP awareness	
No	118 (79)
Yes	32 (21)
Willingness to use PrEP^a	
Very willing	144 (96)
Probably willing	2 (1)
Probably unwilling	1 (1)
Very unwilling	1 (1)
Willingness to take PrEP tablet daily^a	
Very willing	146 (97)
Probably willing	2 (1)
Probably unwilling	1 (1)
Very unwilling	1 (1)
Likelihood of remembering to take PrEP daily^a	
Extremely unlikely	31 (21)
Unlikely	13 (9)
Neutral	2 (1)
Likely	48 (32)
Extremely likely	55 (37)
Willingness to disclose PrEP use^a	
Very willing	135 (90)
Probably willing	9 (6)
Probably unwilling	1 (1)
Very unwilling	4 (3)

^aMissing data due to not knowing or refused to answer: use PrEP, n = 2; take PrEP daily, n = 1; remember to take PrEP daily, n = 1; disclose PrEP use, n = 1

pick-up ($\beta = 0.22$; 95% CI 0.19, 0.23). Clinic wait time was the least valued attribute ($\beta = 0.15$; 95% CI 0.16, 0.26).

Women most preferred to receive PrEP at family planning clinics (mean level utility = 0.16; SD = 0.21) or at NGO-run drop-in centers (mean level utility = 0.16; SD = 0.20) compared to STI clinics (mean level utility = 0.04; SD = 0.25). ART clinics were not valued (mean level utility = -0.01; SD = 0.42), and women had strong preferences against accessing PrEP from NGO-run mobile outreach (mean level utility = -0.38; SD = 0.17). Women were most interested in having PrEP offered with cervical cancer screening (mean level utility = 0.12; SD = 0.25), closely followed by contraceptive provision (mean level utility = 0.11; SD = 0.41), then pregnancy testing (mean level utility = 0.04; SD = 0.38). Partner risk reduction counseling (mean level utility = -0.24; SD = 0.25) was the least valued option of additional reproductive health services. Male was the preferred provider gender (mean level utility = 0.13; SD = 0.21). Women preferred picking up PrEP every 2 months (mean

level utility = 0.10; SD = 0.20) to monthly (mean level utility = 0.02; SD = 0.11) or every 3 months (mean level utility = -0.12; SD = 0.03). Women valued shorter wait times at the clinic, such as 1 h (mean level utility = 0.12; SD = 0.02) to 2 h (mean level utility = -0.09; SD = 0.31) and 3 h (mean level utility = -0.03; SD = 0.15).

Discussion

To our knowledge, this was the first study to examine PrEP delivery preferences among FSW in Malawi using DCE. Daily oral PrEP is an effective HIV prevention method that, although part of the national HIV prevention policy for FSW, [43, 44] has not yet been implemented. The majority of women in our sample were unaware of PrEP before this study. Previous DCE evaluations among key populations at risk for HIV have examined preferences for experimental modalities of PrEP, including long-acting injectables [30, 31]. Our focus on daily oral PrEP provides direct implications for the roll-out of PrEP in Malawi.

An overwhelming majority of FSW in both the FGDs and survey reported a willingness to use PrEP if it was to become available in Malawi. As part of this study, we did not examine perceptions of risk, which may have provided insights on the motivations to use PrEP as well as the need for PrEP. Nonetheless, over half of FSW in our sample reported having a client demand not using a condom, and nearly 40% reported inconsistent condom use with clients, demonstrating the need for HIV prevention, such as PrEP, among a substantial proportion of our sample. As daily oral PrEP becomes available in Malawi, further evaluations will be imperative to examine the willingness for experimental modalities, such as long-acting injectables and event-driven PrEP [30–32], risk perception, and risk factors to determine accurate risk perception for tailoring HIV prevention strategies that include multiple PrEP modalities.

While it is plausible that nearly all the participants were interested in using PrEP as an effective prevention method, participants may have given what they perceived to be more socially desirable responses during the face-to-face interviews. To minimize social desirability bias, our interviewers were trained in non-judgmental interviewing techniques, as well as ensuring participants their responses would remain confidential and not interfere with receiving any HIV prevention services in the future. It is also important to note that we are unable to make inferences on actual uptake behaviors or preferences due to PrEP willingness based on hypothetical receptivity [45]. Future research is needed to examine stated preferences in light of actual PrEP acceptability and uptake within various delivery models.

Dispensing location for PrEP uptake was the most preferred attribute among FSW who participated in the

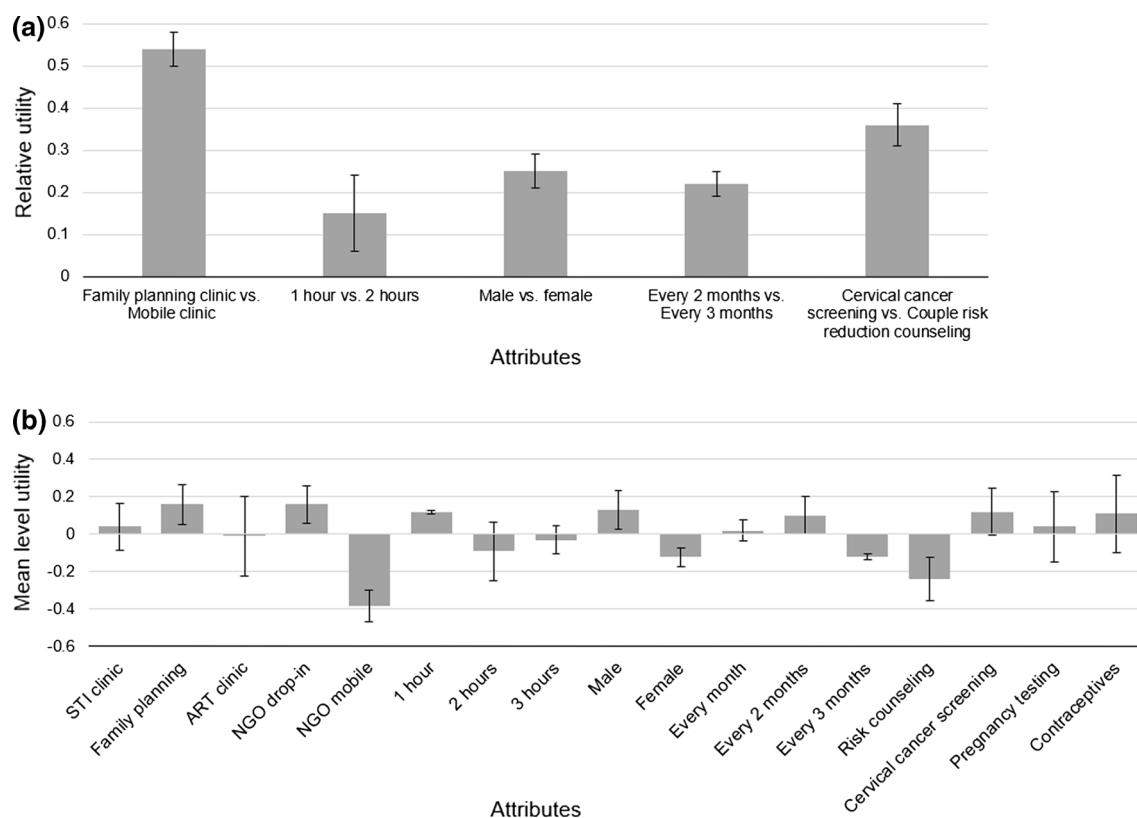


Fig. 2 Preferences of PrEP delivery among female sex workers in Lilongwe, Malawi (n = 150). **a** Relative utilities and 95% confidence intervals between most preferred and least preferred within attributes; **b** mean level utilities of attributes and standard deviations

formative FGDs and DCE, which may signal known barriers to HIV prevention service utilization. Stigma and discrimination, particularly within healthcare facilities, is commonly reported in sub-Saharan Africa and can lead to FSW not engaging HIV prevention or treatment services [23]. Although engaging in sex work in Malawi is decriminalized, community, and healthcare provider stigma remain a critical barrier for receiving HIV services [9, 23]. While, given this established barrier, we anticipated that NGO-run drop-in centers that specifically target FSW would be a preferred location to receive PrEP. However, this type of differentiated care did not emerge as an important attribute influencing PrEP uptake among FSW participating in the FGD, yet, drop-in centers were strongly preferred among those participating in the DCE. The feasibility and implementation of differentiated HIV service delivery models, such as drop-in centers, should be explored as an approach to reach FSW for effective HIV prevention methods.

Within the DCE, mobile outreach for the provision of PrEP was not as valued to FSW as other clinic settings, which was contrary to our FDG findings where women emphasized mobile outreach as a preferred location. FSW are hard-to-reach populations for HIV prevention and treatment services; therefore, they require strategic efforts for

engaging in care. In similar settings, mobile outreach has been used to provide services to FSW and other populations where transportation may be a barrier [46–49]. Generally, outreach activities have had high uptake and reached many who were not routinely receiving HIV prevention services, including HIV testing. It is possible that although mobile outreach is convenient, women may prefer the privacy and confidentiality that a clinic setting affords. Due to the value placed on other dispensing locations, differentiated care clinics, and family planning clinics rather than mobile outreach may be optimal venues to target FSW for PrEP delivery.

In addition to the dispensing location, the provision of additional services was a strongly preferred attribute. Women in our study valued cervical cancer screening and contraceptive provision. Cervical cancer screening and contraceptive provision are services which in recent years have been expanded for women in Malawi [50–52]. National cervical cancer screening rates have nearly doubled in Malawi, with an estimated 14% screened in 2012 to nearly 30% screened by 2015 [50]. Contraceptive use in Malawi is also increasing, with an estimated 38% of all Malawian women of reproductive age using modern contraceptive in 2012 to nearly 50% in 2018 [52]. Pairing PrEP with these services could have multiple benefits including the increase PrEP

uptake as well as utilization of cervical cancer screening and contraceptives. Similar to HIV prevention and treatment services, stigma and discrimination within clinical settings also hamper FSW engagement in general sexual and reproductive health services [53, 54]. Additionally, a lack of familiarity with available services and inconvenient clinic settings may further exacerbate suboptimal engagement [54]. Expanding HIV prevention services to include PrEP along with other sexual and reproductive services could optimize PrEP uptake among FSW in Malawi.

As part of this study, we did not measure direct assessments of PrEP preferences. While direct assessments could have informed deconstructed preferences for each attribute for PrEP service delivery, it does not allow for the enhanced understanding of preferences and decision making within the context of multiple attributes, which is a true advantage of DCE [28, 29]. Furthermore, our sample size limited our ability to examine the heterogeneity of factors influencing preferences. Future population-based samples could provide greater insights on potential diversity in testing preferences among FSW in Malawi.

Conclusions

DCE is a powerful elicitation tool that can be applied when designing HIV prevention programs for other FSW and key populations at risk for HIV. FSW in our study had clear preferences for dispensing location and the provision of additional services. Our emphasis on the end-user for PrEP demonstrates priority areas for HIV prevention programs to reach FSW and ultimately reducing HIV risk. Dispensing location and the provision of additional services, such as cervical cancer screening and contraception, should be prioritized when designing and rolling out FSW tailored PrEP delivery strategies in Malawi.

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Author Contributions KEL and TL had overall responsibility for implementing the study, and conceived and designed the study, analyzed the data, and led the manuscript writing. KEL, TL, MCH, VFG, CEG, SBW, and WCM contributed to developing the study concept and design. TL, AG, and JS contributed to data collection. JS, AS, and REK assisted with data analysis and results interpretation. JS, AS, MCH, REK, IFH, VGO, CEG, SBW, and WCM contributed to drafting the manuscript. All authors reviewed the manuscript critically for intellectual content. All authors read and approved the final draft of the submitted manuscript.

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Compliance with Ethical Standards

Conflict of interest Authors declare that they have no conflict of interest.

Ethical Approval All procedures performed in studies involving human subjects were in accordance with the ethical standards of the institutional research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed Consent Informed consent was obtained from all individual participants included in the study.

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