Preferences for pre-exposure prophylaxis for HIV: A systematic review of discrete choice experiments

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Summary

Background We aimed to systematically review the health preference literature using discrete choice experiments (DCEs), an attribute-based stated preference method, to investigate patient preferences for HIV pre-exposure prophylaxis (PrEP).

Methods A search in PubMed, Scopus, CINAHL, and Embase was conducted on July 1, 2021, and updated on November 3, 2021. We used two concepts to create our search strategy: (1) discrete choice experiments/conjoint analysis/best-worst scaling, and (2) HIV PrEP.The study is registered in PROSPERO (CRD42021267026).

Findings In total, 1060 studies were identified, and 18 were included in the analysis. Various attributes were examined, including dosing regimen, type of PrEP products, side effects, other side benefits, cost, effectiveness, dispensing venue, and additional support services. Dosing frequency, cost, the effectiveness of PrEP, dispensing venue, and side effects were the most common attributes examined in DCEs. Despite significant heterogeneity in preferences across subpopulations, overall, the most important attributes were cost (28%, 5/18), effectiveness (28%, 5/18) followed by dosing frequency (17%, 3/18).

Interpretation Notably, in studies where all of these three attributes were examined, some individuals would trade effectiveness for cost or vice versa. Ensuring PrEP is low cost or free, widely disseminating information of its effectiveness and advancements in reducing dosing frequency could accelerate the uptake of PrEP for those who would benefit from PrEP the most.

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Introduction

HIV pre-exposure prophylaxis (PrEP) is the use of antiretroviral medications by people without HIV and offers up to 99% protection against HIV infection when taken as prescribed.[1] HIV PrEP is of benefit at an individual level and, by reducing HIV transmission, potentially at the population level as well.[2-5] Due to its proven benefits, PrEP was recommended by the World Health Organization (WHO) in 2015 as an additional prevention choice for people at substantial risk of HIV as part of combination HIV prevention approaches.[6-9] This was updated in 2019 to include the recommendation on event-driven or on-demand PrEP,[10] and in 2021 on vaginal ring PrEP.[11]

Current levels of PrEP access are not sufficient to significantly affect the course of the HIV pandemic.[12] Despite strong evidence on the benefits of PrEP, and a commitment by the United Nations to have 3 million people at high risk of HIV infection accessing PrEP by 2020,[13] it is estimated that 927,277 were using PrEP at the end of 2020.[14] In Q3 of 2021, the figure had increased to 1,544,777,[14] with the majority of users located in the Americas (42%) and Africa (34%).[12,15,16] Further, while the intention is for PrEP to be used dynamically in accordance with risk (i.e., particularly to be used during periods of risk), a systematic review reported that at least one-third of PrEP users had discontinued PrEP within six months.[17] Several barriers were noted at the individual and structural levels, such as internalized stigma about risk behaviours (including stigma towards key populations and personal feelings of shame about having condomless sex), inaccurate perception of risk, financial or language barriers, and segmented health systems.[18,19]

The design of a successful PrEP program, including the type of products being used and how products are delivered through the program, should involve affected communities from inception to implementation. This includes eliciting individuals' preferences so that programs can be tailored to meet their needs and preferences, consequently improving the appeal and uptake of PrEP. One method increasingly used to quantitatively measure preferences is discrete choice experiments (DCEs).[20] Government bodies increasingly utilize DCE surveys in their decision-making.[21,22] In a DCE survey, participants are asked to choose their preferred option among two or more alternatives describing a product or service as a combination of attribute levels. These choice data provide information about the strength of preferences for attributes and how individuals trade off one attribute against another. In HIV research, DCEs have been used to elicit preferences towards several aspects of HIV care, including HIV testing and self-testing[23,24] and HIV treatment services.[25]

As PrEP programs continue to be scaled up globally, using different service delivery approaches and a range of new PrEP products (including injections[26] or vaginal rings[27]), it is critical to understand and account for the values and preferences of people who would benefit from PrEP. In recent years, studies have been conducted to evaluate the preferences for PrEP using DCEs, however, there has not been a systematic review to synthesize the overall health preference evidence on this topic. These data could help inform guideline development, program planning, and implementation.[28] Thus, we aimed to review the existing health preference data for PrEP as elicited from DCEs.

Methods

We conducted a systematic review following guidance from the Cochrane Handbook 5.1.[29] The study was registered in the international prospective register of systematic reviews (PROSPERO, CRD42021267026).

Inclusion criteria

We included studies if they met the following criteria: (i) reported participant preferences for PrEP; and (ii) presented primary data using a DCE. No restrictions were placed on the publication date. We excluded qualitative studies, studies without primary data, duplicates, studies not in English, studies with no full text, conference papers, study protocols, and commentaries.

Search strategy

A literature search was conducted on July 1, 2021, and updated on November 3, 2021. We searched PubMed, Scopus, CINAHL, and Embase using two concepts to create our search strategy, combining the Mesh terms and free text words and synonyms of: (1) discrete choice experiments/conjoint analysis/best-worst scaling, and (2) HIV pre-exposure prophylaxis. Further details are provided in Supp.1.

Data screening and extraction

Two reviewers (LW, SH) independently screened the titles and abstracts for inclusion and identified eligible studies using the software, Covidence (Veritas Health Innovation, Australia). Subsequently, full texts were read independently by two reviewers (LW, SH) to determine their inclusion. All discrepancies were resolved by a third reviewer (JO). Full texts of the eligible studies were then independently extracted by two authors (LW, SH), and again checked by the third reviewer (JO) who resolved any discrepancies. We extracted the following data: author, country, year of publication, study year, the aim of the study, sampling strategy, inclusion criteria, recruitment site, number of participants, participants' risk group, experience with the PrEP product, and type of PrEP. We also extracted data related to the conduct of the DCE (survey administration,

attribute selection strategies, whether the DCE was piloted, experimental design, attributes and attribute levels used in the DCE, number of choice tasks per person, statistical models, and results). The quality of the study was evaluated using the PREFS checklist, a published tool used to assess the quality of studies examining preferences.[30]

Data synthesis

Descriptive statistics were used to summarize the study characteristics (i.e. frequencies and percentages). We used narrative synthesis to provide an overview of included studies, focusing on how DCEs were conducted and their main results. We report our findings following The Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) guidelines.[31]

Role of the funding source

No specific funding was received for this study. All authors took the decision to submit for publication. LPLW and HSY had access to the data.

Results

Study characteristics

In total, 1060 studies were found, and 18 studies were included in the analyses (Figure 1). Table 1 summarizes the major characteristics of the studies. Briefly, most studies (83%, 15/18) were published in or after 2018. Most focused on preferences of men who have sex with men (MSM) (ten studies), followed by female sex workers (FSW) (five studies), four among youth or adolescents, and two included injecting drug users (IDUs).

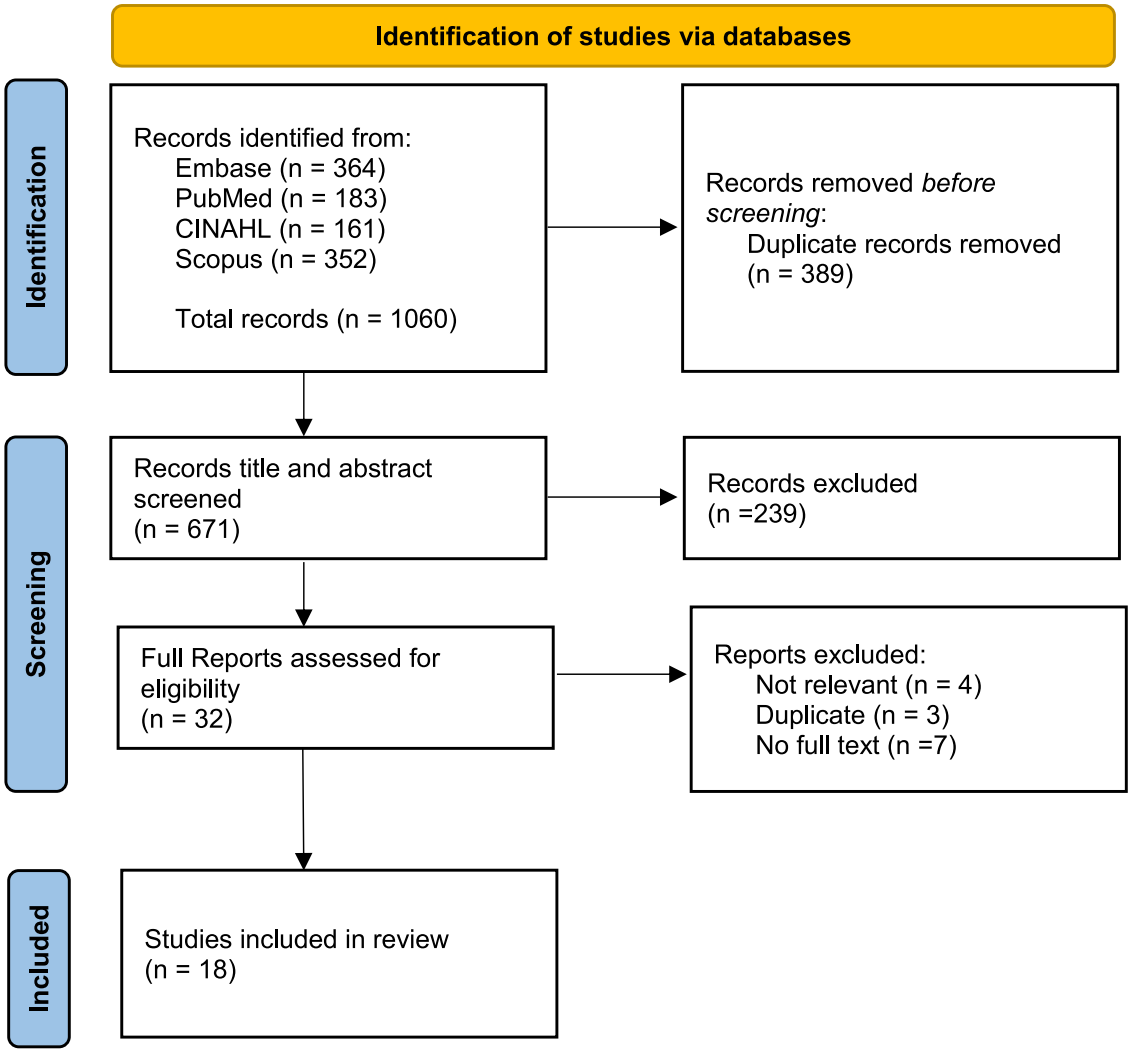

Figure 1. Schematic flowchart demonstrating the identification, screening and inclusion of studies, based on the inclusion and exclusion criteria.

Authors	Year of study	Country	Population	Inclusion Criteria
Browne et al[45]	2016-2017	Zimbabwe and South Africa	Women	Aged 18-31 years, Female, HIV-negative, Sexually active, Microbicide and PrEP naïve, Not pregnant.
Chakrapani et al[58]	2016-2017	India	MSM	Aged 18 years or more, Self-identified as kothi, gay, bisexual, versatile, panthi or MSM, Sexually active with another man in the previous month, Willing to provide consent for participation, Willing to invite peers.
Dubov et al[39]	2016	Ukraine	MSM	Aged 18 years or more, Self-reported HIV-negative, Any sexual contact with another man in the past six months, No previous history of using Truvada for PrEP.
Dubov et al[61]	2015	U.S.	MSM	Aged 18 years or more, Self-identifying as MSM, Self-reported HIV-negative, No previous PrEP experience.
Eisingerich et al[62]	2010-2011	Peru, Ukraine, India, Kenya, Botswana, Uganda and South Africa.	FSW, MSM, IDU, SDC and young women	Aged 18 (16 for young women in Botswana) years or more, Self-reporting a negative or unknown HIV serostatus, Sexually active, Not participating in a market research study in the past 12 months.
Galea et al[42]	-	Peru	FSW, male-to-female TG, MSM	Self-reported HIV-negative
Gutierrez et al[50]	2020	U.S.	U.S. military MSM and trans-individuals	Self-reported HIV-negative
Kuteesa et al[63]	2016-2017	Uganda	Residents of the fishing community	Aged 18 years or more, Residence in the fishing community for over three months.
Lancaster et al[57]	2016-2017	Malawi	FSW	Aged 18 years or more, Be able to speak English or Chichewa, the predominant local language, HIV-negative.
Minnis et al[51]	2017-2019	South Africa	Youth	Aged 18 to 24 years, Female and male youth, Had not participated in a biomedical HIV prevention trial of a PrEP product.
Minnis et al[38]	2015-2017	South Africa and Kenya	Young women	Aged 18 to 30 years, Young women, Had participated in a biomedical prevention trial of PrEP product (TRIO Study), Women from the same communities who had not used the three PrEP products in the same study.
Montgomery et al[52]	2017-2019	South Africa	Youth including MSM	Aged 18—24 years, Residing in the sampled residential plot, Had not participated in a biomedical HIV prevention trial of a PrEP product.

Table 1 (Continued)

Authors	Year of study	Country	Population	Inclusion Criteria
Pines et al[64]	2016-2017	Mexico	FSW	Aged 18 years or more, Cisgender female, HIV-negative, Reported exchanging sex for money, drugs, or goods (past month), Reported condom-unprotected vaginal/anal sex with a client (past month), Agreed to accept free treatment if they tested STI-positive, Owned a cell phone.
Quaife et al[65]	2015	South Africa	Adult males and females, adolescent girls, FSW	Adult men and women, and adolescent girls, Adolescent girls did not require to be sexually active.
Salinas-Rodriguez et al[66]	2018-2019	Mexico	MSW	Aged 18 years or more, Assigned male sex at birth, Be able to read and speak Spanish fluently, Had tested negative for HIV at least once in the past six months, self-reported sexual penetration or oral sex in the last six months with at least eight men, having exchanged money, drugs, alcohol or gifts for sex a minimum of 8 times in the last month, Be able to provide written informed consent for study participation.
Shrestha et al[41]	2016	U.S.	IDUs	Aged 18 years or more, HIV-negative, Drug- or sex-related HIV risk behaviours in the past six months.
Tan et al[40]	2019	Singapore	MSM	Aged 18 years or more, Identify as a cisgender or transgender male, Identify as non-heterosexual, Being a Singapore citizen, resident, or a foreign national residing in Singapore for more than a year at the point of the survey, HIV-negative.
Wheelock et al[67]	2011	Thailand	MSM, TGW	Aged 18 years or more, Self-identifying as MSM, Self-reporting a negative or unknown HIV serostatus, Being sexually active, Not participating in a market research study in the past 12 months.

***Table 1*: Characteristics of 18 included discrete choice experiment studies on pre-exposure prophylaxis for HIV.**
PrEP = HIV Pre-exposure prophylaxis; MSM = Men who have sex with men; kothi = feminine gender expression, mostly receptive sexual role; versatile = insertive and receptive sexual roles, self-identified as "double-decker" in Chennai; panthi = masculine gender expression, primarily insertive sexual role; FSW = female sex workers; IDU = injecting drug users; SDC = serodiscordant couples; male-to-female TG = male-to-female transgender; PrEP product = i.e. vaginal gel, vaginal ring, oral tablet or injection; TRIO study = the Tablet, Ring, Injection as Options Study; Adult = aged 18 to 49 years; adolescent = age 16 to 17 years; STI = Sexually transmitted infections; MSW = male sex workers; IDUs = injecting drug users; TGW= transgender women.

Figure 2. Geographical location of 18 included studies in 13 countries.

The studies were conducted in 13 countries. Three studies (17%) were conducted in multiple countries, four (22%) were from high-income countries, ten (56%) were from middle-income countries, and two (11%) were from low-income countries.

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The implementation of the DCE

Among these 18 studies, 13 (72.2%) were conducted face-to-face. Fifteen (83%) explicitly mentioned the use of formative research before the conduct of the DCE, including through focus group discussions or interviews with target groups or communities, academics, or policymakers. Twelve (67%) studies reported conducting a pilot DCE survey before the main study. The number of choice tasks per person ranged from 4 to 14, with a median of 8. Among those studies that provided the information, two recruited product naÿve participants, and three involved both product naÿve and experienced participants. (Table 2).

Attributes included in DCE studies

Various attributes were examined, including dosing regimen, type of PrEP products, side effects, other side benefits, cost, effectiveness, dispensing venue, and additional support services. Dosing frequency, cost, the effectiveness of PrEP, dispensing venue, and side effects were the most common attributes examined in DCEs. Despite variations in preferences across subpopulations, overall, important attributes most frequently preferred by the participants were cost (28%, 5/18), effectiveness (28%, 5/18) followed by dosing frequency (17%, 3/18). Notably, in studies where all these three attributes were examined, some individuals would trade effectiveness for cost or vice versa (Table 3).

Assessment of the study quality

The overall reporting quality was acceptable but left some room for improvement. Fifteen studies met four of the five PREFS criteria and three met only three. The mean score was 3.83 (standard deviation [SD] 0.38), and the scores ranged from 3 to 4 (Supp. 2). None of the studies reported on differences between responders and non-responders, which might lead to non-response bias. Also, three studies excluded some responders from the analysis but did not investigate the impact of these exclusions on study results. The most commonly noted reasons for exclusion were that responders failed the comprehension test or did not answer enough choice tasks.

Discussion

This systematic review synthesizes the existing health preference data for PrEP as elicited from published DCEs. Our study adds to the literature by highlighting the values and preferences of populations that would benefit from PrEP. We found 18 studies that were conducted in 13 countries. These studies revealed that dosing frequency, cost, the effectiveness of PrEP, dispensing venue, and side effects were the most common attributes included in DCEs. Notwithstanding

Authors	Type of participants (experience with the product)	Survey administration	Attributes Selection	Pilot tested DCE	Experimental study design	Number of choice tasks per person	Statistical models
Browne et al[45]	Product-experienced and product-naïve	Face-to-face, using a tablet device	Literature review	Yes	D-efficient design	8	Random-parameters logit (RPL) model
Chakrapani et al[58]	Not clear	Face-to-face, using a tablet device	Literature review and qualitative research with MSM	Yes	D-efficient design	8	RPL
Dubov et al[39]	Product-naïve	Online survey	Literature review, in-depth discussions with multiple stakeholders, including public health researchers, PrEP community activists, and MSM	Yes	Sawtooth Software's experimental design module	14	Latent class analysis (LCA)
Dubov et al[61]	Product-naïve	Online survey	Literature review, and in-depth discussions with multiple stakeholders	Yes	Sawtooth Software's experimental design module	14	LCA
Eisingerich et al[62]	Not clear	Face-to-face	Literature review, discussions with academic, policy, and industry experts	Yes	'Efficient' design using SAS 9.3 software	10	Hierarchical Bayes (HB)
Galea et al[42]	Not clear	Face to face	Literature review, focus group discussions	Yes	Fractional factorial orthogonal design	8	One-way analysis of variance (ANOVA) model
Gutierrez et al[50]	Product-experienced and product-naïve	Online survey	Literature review, in-depth qualitative interviews among PrEP experts and military MSM	Yes	Sawtooth Software's experimental design module	8	HB
Kuteesa et al[63]	Not clear	Face to face	Scoping review, focus group discussions and individual interviews	Yes	D-efficient design	10	Multinomial logit (MNL) + LCA
Lancaster et al[57]	Not clear	Face to face, interviewer-administered	Literature review, focus group discussions	Not clear	Sawtooth Software's experimental design module	8	RPL
Minnis et al[51]	Not clear	Face-to-face, interviewer assisted	In-depth interviews, focus group discussions, expert consultations, feedback, and pretesting	Yes	D-efficient design	9	RPL
Minnis et al[38]	Product-experienced and product-naïve	Face-to-face	In-depth interviews	Yes	D-efficient design	8	RPL
Montgomery et al[52]	Not clear	Face to face, tablet-device	'Formative research'	Yes	Not clear	9	LCA
Pines et al[64]	Not clear	Interviewer-administered, face to face survey	Literature review	Not clear	D-efficient design	12	MNL
Quaife et al[65]	Not clear	Interviewer administered, face to face, tablet-device	Literature review and focus-group discussions	Yes	D-efficient design	10	MNL + LCA
Shrestha et al[41]	Not clear	Audio computer-assisted self-interview	Literature review and discussions with experts	Not clear	Fractional factorial orthogonal design	8	'Conjoint analysis'
Tan et al[40]	Not clear	Online	Literature review	Yes	Sawtooth Software's experimental design module	4	MNL, generalized multinomial logit model (GMNL), LCA
Wheelock et al[67]	Not clear	Interviewer-administered, face to face survey	Literature review and discussions with experts	Not clear	Orthogonal fractional factorial design	10	HB
Salinas-Rodriguez et al[66]	Not clear	Face to face, via computer tablets.	Literature review	Yes	Not clear	8	MNL, RPL and rank-ordered logit

***Table 2*: Conduct of the discrete choice experiments.**

Authors	Dosing regimen	Type of PrEP	Benefits	Extra services	Additional benefits	Barriers	Access	Most important
Browne et al[45]	Timing	Mode of insertion	Effectiveness of HIV prevention		Pregnancy prevention, Use in secret	Side effects		Effectiveness of HIV prevention
Chakrapani et al[58]	Timing		Effectiveness of HIV prevention			Cost, Side effects	Dispensing location	Effectiveness of HIV prevention
Dubov et al[39]	Timing			Monitoring, Adherence support		Cost	Dispensing location	Cost
Dubov et al[61]	Timing			Monitoring, Adherence support		Cost	Dispensing location	Cost
Eisingerich et al[62]	Timing	Product form		Monitoring		Time spent obtaining PrEP	Dispensing location, Frequency of pick up	Timing
Galea et al[42]	Timing, Duration of use		Effectiveness of HIV prevention			Cost, Side effects	Dispensing location, Provider type	Cost
Gutierrez[50]		Product form		Monitoring			Dispensing location, Provider type	Product form
Kuteesa[63]		Product form	Effectiveness of HIV prevention		Pregnancy/STI prevention, Use in secret	Waiting time		Effectiveness of HIV prevention
Lancaster[57]				Additional preventive services		Waiting time	Dispensing location, Provider type, Frequency of pick up	Dispensing location
Minnis et al[51]	Timing	Product form, Delivery location on the body				Side effects	Dispensing location	Timing
Minnis et al[38]	Timing		Effectiveness of HIV prevention			Side effects; Impact on menstruation		Effectiveness of HIV prevention
Montgomery et al[52]	Timing	Product form, Delivery location on the body				Side effects	Dispensing location	Timing
Pines et al[64]	Timing	Product form	Effectiveness of HIV prevention		STI prevention	Cost, Side effects	Dispensing location	Product form
Quaife et al[65]	Timing	Product form	Effectiveness of HIV prevention		Pregnancy/STI prevention	Side effects		Effectiveness of HIV prevention
Salinas-Rodriguez et al[66]				Incentives (amount, format, type), Adherence test				Incentives type
Shrestha et al[41]	Timing		Effectiveness of HIV prevention	Monitoring		Cost, side effects	Dispensing location	Cost
Tan et al[40]			Effectiveness of HIV prevention	Monitoring	STI prevention	Cost	Dispensing location	Cost
Wheelock et al[67]	Timing			Monitoring		Waiting time	Dispensing location, Frequency of dispensing medication	Monitoring

***Table 3*: Attributes included in the discrete choice experiment studies.**

variations in preferences across subpopulations, cost, PrEP effectiveness and dosing frequency were the main drivers for PrEP use across the studies.

Despite there being at least 84 countries with PrEP programs[32] and 120 countries adopting PrEP recommendations in their national guidelines,[16] our systematic review found only 18 studies from 13 countries with data on PrEP preferences elicited from DCEs. These were mostly conducted in countries such as the U.S., South Africa, and Thailand, with relatively larger numbers of PrEP initiations.[32] In contrast, we did not find choice data from countries with lower rates of PreP initiatives but with higher rates of HIV incidence among key populations, such as the Philippines. This highlights gaps in the current literature and the importance of focusing efforts on deriving preference data to improve program acceptability and efficiency. As has been seen in the case of contraceptives, methods involving different attributes whereby individuals could choose and trade one characteristic for another, have the potential to play a significant role in promoting uptake and coverage.[33]

The methods used to elicit preferences under the DCE approach are important when involving respondents from marginalized populations.[34] We found that the majority of DCE surveys were conducted using face-to-face interviews. This method may enable respondents to ask questions or receive assistance with the DCE survey if required but could lead to social desirability bias (i.e., the tendency to provide a socially desirable response[35]). This must be balanced against the convenience and confidentiality of an online DCE survey, which may overrepresent those with better education and higher income.[36] Some studies did not conduct a pilot test before the DCE survey. This may impact the comprehensibility of the survey, particularly when participants have lower education levels, or are from a different cultural background.[37] It is also worth noting that some studies included experienced PrEP users while others only recruited PrEP-naÿve participants. Although we did not find significant differences in preferences across these two groups, it should be acknowledged that preferences may change depending on experience and contact with the products.[38] This might also be important for countries newly introducing PrEP or those with limited availability and low awareness of PrEP versus countries with well-established programs with good community awareness. Therefore, we recommend that future DCEs include both PrEP-experienced and PrEP-naÿve respondents where possible, to assess whether preferences differ between the two groups.

The cost was a significant driver in the choice to use PrEP across a range of settings and populations. For example, in Ukraine, the high cost of PrEP played a prominent role in the choice of MSM to use PrEP and making PrEP on demand more attractive.[39] Similarly, in a study from Singapore, cost-related issues were the main barriers to accessing PrEP, as PrEP remains unsubsidized by the government.[40] In the United States, IDUs reported higher acceptability of PrEP if the cost was covered by insurance.[41] Furthermore, a study from Peru found that people were significantly more likely to use PrEP with a low out-of-pocket cost or when it was supplied free of charge.[42] Key populations and their sexual partners accounted for 65% of new HIV infections globally in 2020[43]; they are also underserved by HIV prevention programs,[12] highlighting major gaps in access to effective biomedical prevention methods like PrEP. Together, this reinforces the importance of the need for free or subsidized PrEP to reach populations who would benefit most from PrEP. Increasing efforts by countries to integrate WHO PrEP recommendations into national guidelines[16] should also be supported through technical assistance to design financial subsidies for national PrEP programs, including the integration of PrEP into the national health insurance coverage schemes.

The perceived effectiveness of PrEP was another important driver of the choice to use PrEP. Evidence of the effectiveness of oral PrEP is well-established and closely linked with adherence.[44] For example, in a study of young women in South Africa and Kenya, HIV prevention effectiveness was the most important factor influencing the choice to use PrEP.[38] Interestingly, although women continue to have high rates of HIV acquisition in Sub-Saharan Africa, the majority were willing to exchange higher effectiveness for other desired attributes (such as the impact on vaginal wetness, pregnancy prevention and dosing regimen), according to a study of women in South Africa and Zimbabwe.[45] Research has shown that the perceptions of effectiveness among target populations influence the acceptance and in turn, the uptake of biomedical interventions.[46] Therefore, wider promotion of PrEP's high effectiveness may attract people to consider PrEP. The potential use of dating apps to promote PreP information may be considered, as it has been shown elsewhere to positively affect beliefs about PrEP effectiveness.[47] For example, Grindr (one of the most popular dating apps) users are more likely to be interested in taking[48] and initiating PrEP.[49]

Dosing frequency was another important driver of choices around the use of PrEP. This is particularly important as new PrEP products come onto the market. Notably, we found this attribute differed significantly across populations, emphasizing the need to obtain context-specific values and preferences data, particularly in regards to the dosing frequency of PrEP. For example, one US study reported that daily oral PrEP was the most desired option for US military MSM and trans-individuals, whereas bi-monthly PrEP injection was most preferred by those who had never used PrEP before.[50] Another study showed that youth in South Africa favoured long-acting options: females and MSM

preferred an injection, which could indicate a strong concern for discreteness in HIV product selection, whereas MSW preferred an implant.[51,52] Confidentiality was a prominent issue that influenced dosing frequency, particularly among key populations. The stigma associated with PrEP also remains a barrier to its uptake, use, and maintenance.[53] In addition, dosing frequency is related to adherence to medication. A meta-analysis reported that reducing the dosage frequency from multiple dosing to one daily dose increases the likelihood of better adherence to therapies across acute and chronic diseases.[54] This could also apply to PrEP use, where evidence shows a preference among users for injectable or implantable PrEP with long-acting characteristics compared with oral PrEP[55]; and better adherence to less frequently dosed injectable PrEP than daily oral PrEP.[26] This may also support the WHO's recommendation on event-driven (as an alternative to daily PrEP),[10] to allow users to have PrEP interruptions during periods of low risk, as a way to improve sustainable PreP uptake.[56] Therefore, programs should effectively support users to adjust their dosing frequency according to fluctuations in their risk level.

Finally, as different service delivery models are considered for scaling up PrEP, it is important to understand the preferences of those who would benefit from PrEP. In general, we found that most participants were willing to receive PrEP in a healthcare setting, but there was some variation in preferences for services. For example, a study in Malawi reported that dispensing location was most important for female sex workers, who preferred accessing PrEP from a family planning clinic or non-government organization (NGO)-run drop-in centre, compared with HIV clinics, STI clinics or NGO-run mobile outreach facilities.[57] A DCE of MSM in India found that participants preferred to acquire PrEP from a government hospital rather than a private one.[58] This may be because participants believe that government-funded PrEP programs are only available through public hospitals.[58] A study from Peru among MSM, transgender individuals and sex workers reported that even though participants shared concerns about stigma and discrimination among health care professionals, they suggested that these professionals were more qualified to distribute PrEP than pharmacists.[42]

A key strength of this systematic review is that it provides an overview of PrEP preferences from a range of geographical settings, population target groups, product attributes, and survey approaches. We specifically focused on studies that used a DCE methodology, as this is one of the recommended methods to elicit preferences for new medical products or services that do not currently exist. Our study should also be read in light of some limitations. First, due to the differences in study attributes, performing a meta-analysis was unlikely to be meaningful. Instead, we qualitatively synthesized and summarized the range of attributes that may be helpful in the formative stage of attribute selection in future DCE surveys examining PrEP preferences. Similarly, due to unknown differences in the scale of the part-worth utilities from each study, we were not able to perform a statistical assessment of this variation. Second, this review was limited only to studies published in English, which may lead to language bias.[59] While we intentionally focused on studies in peer-reviewed journals - excluding the grey literature to ensure the quality of studies selected - we may have missed other relevant literature.[60] Finally, most DCE studies have focused on product attributes and used simplistic attributes related to service delivery (such as dispensing venue or additional support services). It would be beneficial for future research to provide greater detail regarding how PrEP services should be designed to optimize uptake.

In conclusion, this systematic review synthesized the global evidence on preferences for PrEP elicited using the DCE approach. Cost, PrEP effectiveness and dosing frequency were the main drivers of choice for PrEP use across the studies. We also found significant variation in preferences across subpopulations. This underscores the importance of conducting context-specific health preference research to optimize PrEP use among people who would benefit from PrEP the most.

Conributors

LPLW and HSY: identification of papers and data extraction, formal analysis, validation, visualisation, writing – original draft, and writing – review & editing, contributed equally. JJO: conceptualisation, identification of papers and data extraction, formal analysis, investigation, resources, software, supervision, validation, writing – original draft, and writing – review & editing. LZ: contribute to the supervision of the study. All other authors: conceptualisation, writing – review & editing. All authors took the decision to submit for publication.

Data sharing statement

Datasets of this study are available upon reasonable request to the corresponding author (JJO).

Declaration of interests

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Supplementary materials

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