



# Multifaceted Barriers to Rapid Roll-out of HIV Pre-exposure Prophylaxis in China: A Qualitative Study Among Men Who Have Sex with Men

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## Abstract

**Background** Oral pre-exposure prophylaxis (PrEP) as a safe and effective antiretroviral medicine-based prevention against HIV has not been widely adopted by gay, bisexual, and other men who have sex with men (MSM) in China. A deeper understanding of barriers and facilitators to PrEP uptake is needed to inform the development of effective interventions.

**Method** During July–August 2020, we conducted one-on-one semi-structured interviews with 31 Chinese MSM with varied PrEP use experiences (PrEP-naïve, former, and current PrEP users). Interviews were digitally recorded and transcribed in Chinese. Informed by the Information-Motivation-Behavioral Skills Model (IMB), we analyzed the data using a thematic analysis approach to identify the barriers and facilitators to PrEP uptake among Chinese MSM.

**Results** Major barriers to PrEP uptake among MSM in the sample included uncertainty about PrEP efficacy and lack of PrEP education (information), concerns over potential side effects and cost (motivation), and difficulties in identifying authentic PrEP medications and managing PrEP care (behavioral skills). Facilitators include the perceived benefit of PrEP in improving the quality of sex life and control over health. At the contextual level, we also identified barriers to PrEP access from a thriving informal PrEP market and stressors related to being MSM.

**Conclusion** Our findings identified a need to invest in non-discriminatory public health messaging of PrEP, explore options for MSM-friendly provision of PrEP outside of traditional HIV care settings, and be attentive to the unique context of an established informal PrEP market in future PrEP initiatives.

**Keywords** HIV · Pre-exposure prophylaxis · Men who have sex with men · China

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## Introduction

As of June 2021, oral pre-exposure prophylaxis (PrEP) had been adopted by over 1.5 million global users for safe and effective HIV prevention [1]. China is home to millions of gay, bisexual, and other men who have sex with men (MSM) and are estimated to be at high risk of HIV infection [2]. Among survey samples, 22–76% of MSM had heard of PrEP [3–6], and fewer than 6000 people were taking PrEP as of April 2021 [7]. Despite this low uptake, Chinese MSM have expressed substantial interest in taking PrEP after learning about it [8, 9], reflecting a potentially large population of individuals who would initiate PrEP if provided the information, access, and support to do so.

The low uptake of PrEP in China is the result of multiple factors. At the structural level, Tenofovir-Emtricitabine (TDF-FTC) for PrEP was not approved by the Chinese National Medical Products Administration until August 2020 [10]. Before this official approval, those who wanted to use PrEP could only do so through a limited number of PrEP clinical trials, off-label use of HIV antiretroviral treatment (ART) or post-exposure prophylaxis (PEP) as PrEP, or purchasing through informal PrEP buyers (*Dài-Gòu*) who import generic medications from neighboring countries like India or Thailand [11, 12]. Two years after the government approval, PrEP is still not readily accessible in medical or public health facilities due to China's already strained HIV care system and limited availability of PrEP training for providers [13].

At the individual level, China-based cross-sectional surveys [3, 12, 15, 16] and PrEP clinical trials [17–19] have reported multifaceted barriers, including low awareness of PrEP, concerns over side effects, financial cost, low HIV risk perception, and anticipated HIV- and minority-related stigma in clinical and societal settings. All these factors working together pose additional barriers for people to access PrEP [14]. While a few China-based qualitative studies have been conducted among Chinese MSM to describe their willingness and perceived barriers to PrEP uptake [18, 20], a more in-depth understanding of the barriers to PrEP uptake and maintenance from a diverse sample of Chinese MSM with varied PrEP-using experience is needed to inform future scale-up efforts tailored to individual needs.

To address these gaps, this study used in-depth interviews among Chinese MSM to identify the behavioral determinants of PrEP uptake based on the Information-Motivation-Behavioral Skills Model (the IMB model) [21], including barriers and facilitators at individual and structural levels that influence decisions to use PrEP. The IMB model has been widely applied in intervention development for PrEP care-related behaviors in global settings [22–24]. It assumes that three core constructs drive an individual's

PrEP use behavior: (1) *information* (knowledge of specific PrEP/HIV facts) [25]; (2) *motivation* (personal and social motivation that influences whether informed individuals will be inclined to use PrEP to prevent HIV) [22]; and (3) *behavioral skills* (individual capacity to enact PrEP use behaviors, such as finding and going to a provider, financial management, and taking the pills correctly) [22]. In addition, social, cultural, and cognitive-affective contexts would also affect the individual's decision [26]. Such contextual factors include health insurance coverage, individual cognitive capacity, and a broader social skepticism toward PrEP [27].

This study solicited perspectives from Chinese MSM with varied PrEP-using experience (never, previous, and current) to enrich our understanding of the real-life challenges faced by the community. The findings are intended to inform the development of culturally appropriate and MSM-friendly intervention tools that prepare Chinese MSM for PrEP uptake, paving the way for a rapid scale-up in China.

## Methods

### Study Setting and Recruitment

This study was the formative assessment phase of a pilot study to develop and test a WeChat-based PrEP education mini-app for Chinese MSM in Guangzhou, China [28]. Findings from the intervention study (including iterative development and pilot test) will be reported elsewhere. In July and August 2020, study advertisements for one-to-one interviews were posted on Chinese social media platforms by the organization Social Entrepreneurship to Spur Health Global (SESH) and local LGBTQ community partners. Potential participants were contacted and initially screened via WeChat text messaging. Eligibility criteria included the following: Chinese citizens, 18 years old or above, HIV-negative by self-report, assigned male sex at birth, and any lifetime sex with another man. Eligible individuals were scheduled for virtual enrollment and interview.

CL led all data collection and analysis activities. All other research team members were actively engaged in conceptualizing the study design, monitoring the data collection process, and providing continuous feedback on data analysis and interpretation via regular meetings with CL. At the time of data collection, CL (the interviewer) was a Ph.D. candidate in Health Behavior major with over 5 years of qualitative research experience in HIV prevention and care among Chinese MSM. CL is a Chinese citizen and received graduate training in public health both in China and in the USA. All the other research team members have varied years of work and lived experiences in China-based HIV- and LGBTQ-health research.

## Interview Procedure

One-on-one semi-structured in-depth interviews were conducted by CL via videoconference (Zoom or WeChat video call) in Mandarin Chinese and lasted 60–100 min. Before the interview started, all participants provided electronically signed informed consent that included an explanation of the study design, purposes, potential risks and benefits, confidentiality, and the voluntary nature of participation. Each participant was interviewed once and received 75 Chinese Yuan (~ 11 USD) as compensation upon completion of their interview. The interview guide (Supplementary file 1) was informed by the IMB model [21] with tailored questions for PrEP-naïve participants and current or former PrEP users. At the start of the interview, CL introduced herself to the participants as a cis-gender female Chinese researcher studying HIV-related LGBTQ health in China. Those previously unaware of PrEP were given a brief standard introduction (Supplementary file 1).

During the interview, participants were asked about their PEP use history, knowledge, attitudes, willingness to use PrEP and PrEP use history, and past pathways, barriers, and facilitators to HIV testing and PrEP services. PrEP-naïve participants were asked about their background knowledge and concerns about using PrEP and how these concerns might influence their decision about whether or not to initiate PrEP. Participants with PrEP experience were asked about perceived and encountered barriers to initiating and managing PrEP and their views on what information they might have wanted to know before starting PrEP. Considering the impact of the COVID-19 pandemic on people's lives and views of health, the experience of the pandemic was also investigated, including people's assessment of any changes in their access to HIV prevention services, HIV testing, and PrEP. CL took notes during interviews and created an interview summary following each interview to capture predetermined and emergent themes. Throughout data collection, authors (CL, KM, JT) regularly met to discuss these summaries and field notes to monitor thematic saturation for each content area. When limited new information emerged, additional interviews with new participants (i.e., previously unrecruited MSM) were conducted to conclude the sample.

## Data Analysis

Interviews were digitally recorded and transcribed by CL in Chinese. Personal identifying information was redacted during the transcription process to ensure participant anonymity. The transcripts were then uploaded to NVivo 12.0 for qualitative analysis. CL applied a thematic analysis approach [29] and an iterative coding process to identify, analyze, and report patterns within the data. First, CL developed an initial deductive coding structure based on

the interview guide (24 codes) and then added emerging inductive codes (101 codes) after reviewing the transcripts of a random selection of 10 participants. Then, three additional interviews with PrEP-naïve and three interviews with PrEP-experienced participants were purposively reviewed to ensure the codebook captured the narratives of men with various PrEP experiences. After this, CL, KM, and JT reviewed and discussed the codebook and English summaries of the transcripts. CL further collapsed the codes into five cross-cutting themes: information (17 codes), motivation (25 codes), behavioral skills (17 codes), contextual factors (15 codes), and other noteworthy findings (7 codes, e.g., barriers to access PEP, HIV testing history, perceived challenges in HIV prevention). CL then applied the finalized codebook to all transcripts with ongoing consultation with KM. Once coding was complete, CL and KM reviewed and synthesized all coded text and analytical memos for major themes and subthemes. All qualitative data analysis was done in Chinese with the translation of exemplary content for English-language publication.

## Ethics Statement

This study was reviewed and approved by the Institutional Review Boards at the University of North Carolina at Chapel Hill (#19–3481), the Southern Medical University Dermatology Hospital (#2020031), and the Guangzhou Eighth People's Hospital (#202022155).

## Results

### Participant Characteristics

The demographic characteristics of 31 enrolled participants and their PrEP-using experience are presented in Table 1. The mean age was 26.5 years old (SD = 5.7). The majority (78%,  $n = 24$ ) self-identified as gay, while 16% ( $n = 5$ ) identified as queer, 3% ( $n = 1$ ) as pansexual, and 3% ( $n = 1$ ) as bisexual. Our sample also included a relatively middle-to-high income group, as about half ( $n = 15$ ) had a monthly income higher than 5000 CNY (~ 770 USD). Regarding PrEP and PEP use, 16% ( $n = 5$ ) of participants had used PEP at least once, and 33% ( $n = 10$ ) had used PrEP before or were currently using it at the time of the interview. Among these ten individuals: 80% ( $n = 8$ ) used an event-driven dosing strategy (i.e., only taking pills before and after a sex event), while only 20% ( $n = 2$ ) used a daily dosing strategy (i.e., taking one pill every day); 30% ( $n = 3$ ) had obtained PrEP pills from local PrEP clinical trials, while the rest obtained PrEP through less formal channels, including friends sharing ( $n = 1$ , 10%) and informal PrEP buyers or distributors ( $n = 6$ , 60%).

**Table 1** Demographic characteristics and PrEP-using experience among participants ( $N=31$ )

Variables	<i>N</i>	%	
<b>Age</b>	18–20	2	7
	21–25	14	45
	26–30	10	32
	30 and above	5	16
<b>Sexual orientation</b>	Gay	24	78
	Bisexual	1	3
	Pansexual	1	3
	Queer	5	16
<b>Relationship status</b>	Having a girlfriend	0	0
	Having a boyfriend	9	29
	Engaged to a woman	0	0
	Married to a woman	0	0
	Single	21	68
	Other	1	3
<b>Highest education level</b>	High school	3	10
	Three-year college	5	16
	Four-year college	18	58
	Master's degree or above	5	16
<b>Monthly income</b>	< 1500 CNY (230 USD)	5	16
	1501–3000 CNY (230–461 USD)	3	10
	3001–6000 CNY (461–923 USD)	8	26
	6001–8000 CNY (923–1230 USD)	4	13
	8001–10,000 CNY (1230–1538 USD)	5	16
> 10,000 CNY (> 1538 USD)	6	19	
<b>Employment status</b>	Full-time student	6	19
	Full-time employee	16	52
	Part-time job	1	3
	Self-employed	1	3
	Unemployed	7	23
<b>Ever used PEP</b> (post-exposure prophylaxis)	Yes	5	16
	No	26	84
<b>Ever used PrEP</b> (pre-exposure prophylaxis)	Yes, used PrEP before, but not now	5	16
	Yes, currently on PrEP	5	16
	No, never used PrEP	21	68
<b>PrEP dosing strategy</b> ( $n = 10$ )	Once daily	2	20
	Event-driven	8	80
<b>Channels of obtaining PrEP</b> ( $n = 10$ )	Clinical PrEP trial	3	30
	Friend sharing	1	10
	Informal PrEP buyer ( <i>Dài-Gòu</i> )	6	60

Given the sample's mix of PrEP-using experience, participant narratives included both experienced and perceived barriers and facilitators to PrEP uptake. These factors were thematically categorized and organized according to the IMB model (Fig. 1): (1) information, e.g., perceived lack of PrEP messaging and uncertainty of PrEP efficacy; (2) motivation, including positive factors (perceived benefits of PrEP in increasing quality of sex life and reducing gay stigma) and negative factors (concerns over PrEP side effects and high cost); (3) behavioral skills, including perceived troubles in

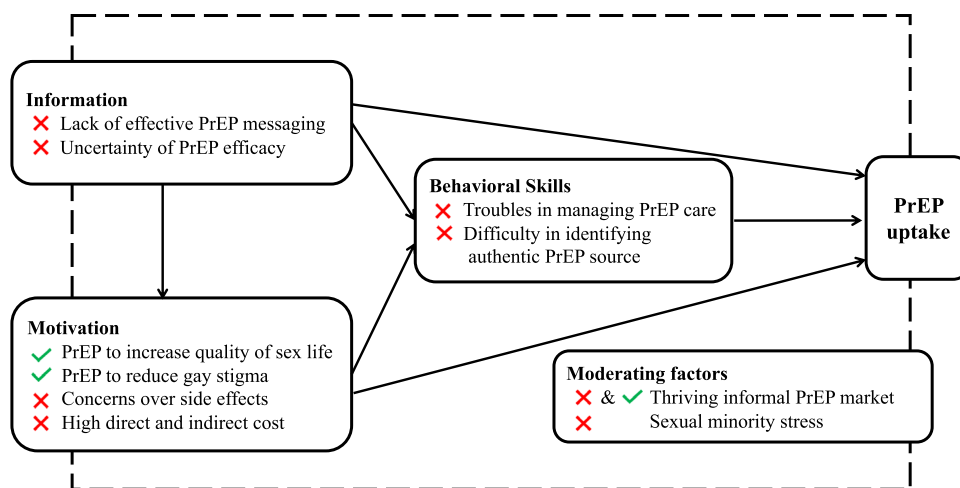
managing PrEP and difficulties in accessing PrEP; and (4) contextual factors, including commonly mentioned minority stress and a thriving informal PrEP market.

## Information

### Lack of effective PrEP Messaging

Only half ( $n = 14$ ) of the participants knew how to access PrEP in China, and four had never heard of PrEP prior to the

**Fig. 1** Relationships between major themes based on the IMB model (barriers to PrEP uptake are preceded by a red “x,” while a green checkmark precedes facilitators)



study. Popularly cited sources of PrEP information included private user accounts on social media (Twitter, WeChat, or gay social apps such as Grindr and BlueD) and personal social networks. A few ( $n=3$ ) learned of PrEP via participation in PrEP clinical trials. Few people who had heard of PrEP described it as a prescription drug that needs to be monitored by a physician. “代购” (*Dài-Gòu*, “surrogate shopper,” i.e., informal PrEP buyers or distributors) were frequently identified as a major source of PrEP-related information among both PrEP-naïve and PrEP-experienced individuals. According to the participants’ description, *Dài-Gòu* typically imports PrEP medicines from overseas (e.g., Thailand, India) and often sells PrEP along with other things, including recreational drugs, sex toys, and gay pornography videos. These informal PrEP buyers often redistribute PrEP to Chinese clients at much lower prices (400–500 CNY/30 pills) than the brand name PrEP (Truvada, 2000 CNY/30 pills) sold in licensed pharmacies. As one participant explained:

[My sources of PrEP information are] mainly two types. One is Twitter, and the other is WeChat. Sina (Weibo, a popular Chinese social media) might have stricter regulations on this, so I don’t see many things [about PrEP] there. It’s mainly from Twitter, especially since Twitter is becoming more popular in recent years. Some people, some strangers, would just follow you (on Twitter) and message you that he is selling some videos [of gay pornography], and then he starts selling you these drugs (imported PrEP and recreational drugs). (*GD05, previous event-driven PrEP user, 22 years old, PrEP source: Dài-Gòu*).

At the time of the interview (July–August 2020), TDF-FTC as PrEP was not officially approved by the Chinese Drug Administration, but off-label use was not rare among MSM. One participant (*GD13, current event-driven PrEP user, 29 years old, PrEP source: clinical trial*) described

his experience of asking an HIV physician to prescribe him Truvada in the name of PEP and later using it as PrEP. When asked how to get PrEP, participants usually answered that they would ask for help from friends or local community-based organizations ( $n=24$ ). Less commonly mentioned was visiting local HIV clinics or other public health facilities ( $n=10$ ).

#### Uncertainty About PrEP Efficacy

One of the most salient themes emerging from the data was uncertainty about the efficacy of PrEP in preventing HIV infection, which was attributed to the lack of thorough and positive messaging about PrEP in China, especially among MSM. To a few participants ( $n=3$ ), PrEP was perceived as a “神奇” (*Shén-Qí*, “unnatural and strange,” i.e., mysterious) medicine without solid scientific support or clinical evidence. As the following participant shared:

In the beginning, I had half doubt and half trust in this drug (PrEP). I only heard about it from other people. It was around 2016. There was not much evidence or official endorsement to state that “it is really effective”. So, I thought this drug was “神奇” (*Shén-Qí*, mysterious). (*GD28, 25 yrs, intermittent PrEP user, PrEP source: Dài-Gòu*).

MSM who had learned more information about PrEP efficacy still described it with uncertainty and as not being fully protective against HIV ( $n=9$ ):

When I saw this (introduction of PrEP), I had a question. It says PrEP can decrease your chance of getting HIV by over 90%. But the remaining 10% (chance of HIV infection) is still high. (*GD03, 30 yrs, PrEP-naïve*).

These participants pointed to such uncertainty in the efficacy of PrEP and their fear of the chance of prevention

failure when describing their perception of PrEP as less effective in HIV prevention compared to condoms and low intentions to use PrEP for regular prevention.

## Motivation

### PrEP Increases the Quality of Sex Life

Half of the sample ( $n=15$ ) endorsed PrEP as preferable to condoms based on a perception that it could help increase the quality of sex by removing the physical barrier of condoms and increasing trust and intimacy between partners. Some MSM ( $n=7$ ) mentioned they would try on-demand PrEP only when wanting to have condomless sex, while at other times, they would prefer condoms due to the financial burden and potential side effects. However, the concern over PrEP's inability to prevent other sexually transmitted infections (STIs) was also commonly mentioned. As illustrated in the quotes below, some participants felt less motivated to use PrEP if they would still need to use condoms to prevent other STIs.

If I'm correct, diseases like syphilis are more contagious than HIV. Condoms are more effective in preventing these diseases. PrEP can decrease the risk of HIV, but it can't decrease the risk of syphilis. Syphilis or genital warts can be easily transmitted by close contact. You will be likely to get syphilis or genital warts if you have sexual contact with others not wearing a condom. (GD04, 24 yrs, PrEP-naïve).

There are many other diseases, right? Besides HIV, there are also many other diseases. And they can all be transmitted by sex. So, wearing condoms is a better way. Now there's some people taking PrEP, and you can only prevent HIV, not other STIs. (GD11, 27 yrs, current event-driven PrEP user, PrEP source: clinical trial).

A few participants ( $n=3$ ) also described PrEP as a tool that could increase their control over their sexual health and reduce the hassle of having to negotiate condom use with partners. In addition, many participants ( $n=11$ ) mentioned that PrEP could be a good backup, especially if they had difficulty with the consistent use of condoms.

The fear of intentional transmission of HIV from others was common. Seven participants quoted anecdotal stories where someone deliberately misused condoms (e.g., pulled off condoms during sex without informing the other partner). An additional three people had experienced similar situations themselves. As one man shared:

They (partner) might take it (condom) off when you don't notice or when you don't pay attention. Physical prevention is not a one-for-all solution. Because, it's not totally within my control. I can control taking the drug because I am taking it. Though sometimes,

I'm also worried about whether I have taken enough (PrEP pills) to be fully protected. So, if using either of the two methods, I would still be worried. But if using them together, I'd feel safer. (GD13, 28 yrs, intermittent PrEP user, PrEP source: clinical trial).

Because HIV is often perceived by the general public in China as only affecting the gay community, the introduction of PrEP as an effective HIV prevention strategy was also phrased by some participants ( $n=3$ ) as a solution to liberate MSM from the fear of HIV and related stigma.

After all, I think the biggest burden on people like us, or the point that outsiders don't like about us the most, is that we can easily get HIV. I think PrEP is a perfect solution to this problem. It can make us free and less concerned. (GD13, 28 yrs, intermittent PrEP user, PrEP source: clinical trial).

Participants who indicated less intention to use PrEP usually described having infrequent sex or low interest in sex, being in a monogamous relationship, or intentionally limiting their sexual encounters.

### Concerns over Side Effects from PrEP

Even when PrEP was perceived as an effective HIV prevention strategy, the general fear of using biomedical preventive medicine was prevalent. About a third ( $n=9$ ) of participants quoted an old Chinese saying: “是药三分毒” (*Shì-Yào-Sān-Fēn-Dú*, “30% of any drug effect is toxic,” i.e., every drug has side effects). This rationale was also cited as a popular reason for choosing on-demand PrEP dosing strategy over the daily dosing strategy, as the latter requires taking more pills and hence is perceived to accumulate more toxicity inside the body. As one participant explained:

One thing is that I worry about the side effects, just like contraception pills to women's uterus. I think “是药三分毒” (*Shì-Yào-Sān-Fēn-Dú*). I think it may have some side effects, or will cause some bad things. It's hard to say. Especially now, I don't have a good understanding of it (PrEP). I'm worried about its risk. (GD01, 26 yrs, PrEP-naïve).

In addition to the direct medical side effects, two participants also expressed uncertainty regarding the potential side effects of PrEP discontinuation or intermittent PrEP use. Questions about health impacts frequently came in the context of men describing limited interest or intention to use PrEP as a long-term HIV prevention strategy. Among PrEP-experienced participants ( $n=10$ ), three described side effects of taking PrEP, including vomiting (when starting medication) and decreased bone density (after longer term use). One participant (GD18, 23 years old, former PrEP user,

PrEP source: clinical trial) stopped taking PrEP because of these side effects and indicated no intention to restart PrEP in the near future.

### High Cost of PrEP

High cost was one of the most salient themes detracting from motivation to use PrEP. Here “cost” refers to both perceived and actual costs, as well as direct (e.g., medication price, clinician consultation fees) and indirect costs (e.g., time and energy spent on transportation to the PrEP clinic, loss of income due to sick leave). At the time of the interview (July–August, 2020), PrEP was only legally accessible in China through PrEP clinical trials, getting Truvada in the name of PEP, or purchasing Truvada from the online drug store operated by the gay social app Blued. For the latter two channels, PrEP is sold at 2000 CNY (~300 USD) per 30 pills — a price point perceived as unacceptable (and inaccessible) to most participants. The financial cost was also cited as a popular reason for choosing on-demand dosing over daily dosing.

To be honest, I don’t often do that (have sex), so the event-driven one may suit me better. And the cost is higher if I take it daily. But recently, I do feel that it is hard to control the desire (to have sex). So, if my financial situation allows, I may switch to daily (PrEP). (25 yrs, intermittent PrEP user, PrEP source: *Dài-Gòu*).

Participants also viewed the costs of PrEP-related clinical visits as too high. Furthermore, the scarcity of PrEP clinics, especially MSM-friendly clinics, decreased individual intention to start PrEP. The majority of HIV prevention clinics in China operate during standard weekday business hours, posing the challenge of needing to ask for sick leave for sexual health or HIV-related reasons. Men were particularly averse to asking for leave in a context with widespread stigma and discrimination toward HIV and gay-identifying populations. When asked about their preferred ways to access PrEP, many participants (both PrEP-naïve and PrEP-experienced) chose community-based organizations (CBOs) and *Dài-Gòu* ( $n = 12$ ) over HIV clinics ( $n = 4$ ) due to the aforementioned inconvenience and mistrust in the healthcare system’s capacity to provide MSM-friendly care. As one man described:

I would definitely prefer to buy it (PrEP) from a friend. Why would I waste my time at the hospital? The hospital can’t do delivery home. It may take me half an hour or a whole hour to travel to the hospital. Not to mention waiting at those [registration and pharmacy] counters. (GD28, 25 yrs, current PrEP user, PrEP source: *Dài-Gòu*).

### Behavioral Skills

#### “麻烦” (*Má-Fán*) — Troubles in Managing PrEP Care

The process of getting a PrEP prescription from a licensed HIV prevention clinic is perceived as time-consuming and “麻烦” (*Má-Fán*, “troublesome,” or hustle, difficulties). These troubles were anticipated across the full process of initiating and sustaining PrEP — such as getting transportation to the clinic, long wait times at the clinic to register, getting tested and picking up prescriptions, and quarterly clinical follow-ups. When asked about their willingness to buy PrEP if it were made available with a 50% reimbursement (as was planned for the subsequent pilot study), participants ( $n = 3$ ) still expressed concerns about encountering such troubles:

If I buy this from the hospital, things will be “麻烦” (*Má-Fán*) for me to go through the reimbursement process. So, I’m half willing to do it. (GD17, 25 yrs, PrEP-naïve).

I need to go to the hospital to buy it (PrEP), right? Going to the hospital is “麻烦” (*Má-Fán*). It is not easy to get the drug. That’s the challenge. (GD21, 48 yrs, PrEP-naïve).

“麻烦” (*Má-Fán*) was also frequently mentioned by participants when they described the need to take PrEP daily or at calculated times. When asked about long-acting injectable PrEP, many ( $n = 14$ ) expressed interest in this new delivery mode as they thought it would impose less burden on daily routines. However, participants ( $n = 11$ ) also described a fear of self-injection and concerns over the “麻烦” (*Má-Fán*) of regular clinical visits if getting the injection from a nurse.

#### Difficulty in Identifying Authentic PrEP

Due to the lack of licensed PrEP providers in China, and the overall low awareness of where to access authentic PrEP, some MSM ( $n = 4$ ) described that they only knew to get PrEP via informal channels such as *Dài-Gòu*. However, many participants ( $n = 11$ ) indicated concern about the drug quality sold through these unregulated informal channels, which decreased their intention to use PrEP. As this participant described:

I think [you can get PrEP] from Twitter. There are some “网黄” (*Wáng-Huáng*, “Internet porn”, i.e., people who are posting home-made pornography videos on Twitter), and some people are selling drugs like PrEP. But I never buy (things from them because) I don’t know if they are authentic or fake. But I’m curious about how to get, how to get these drugs through formal and trustworthy channels. (GD20, 24 yrs, PrEP-naïve).

Those who accessed PrEP via *Dài-Gòu* also faced the challenge of an unstable drug supply. Having a stable supplier heavily relied on personal networks. One of the PrEP users explained how he was able to stock up on PrEP medicines before the country-wide lockdown due to COVID-19 in early 2020 due to his close relationship with the supplier:

The pandemic has really made things “麻烦” (*Má-Fán*). I was lucky that my [PrEP] supplier was able to make some arrangements. Otherwise, it would be really “麻烦” (*Má-Fán*). (*GD09, 31 yrs, current PrEP daily user, PrEP source: previously clinical trial, now Dài-Gòu*).

Another participant described how interrupted *Dài-Gòu* supply contributed to his stopping PrEP:

Because of COVID, there were some problems with *Dài-Gòu*. And I was also trying to adjust my body status. I had less sex. So, I didn't see there was a need for me to continue using it (PrEP). (*GD19, 27 yrs, former PrEP user, PrEP source: Dài-Gòu*).

All of these obstacles to accessing safe, affordable PrEP through formal and informal channels added difficulties for individuals to initiate or sustain PrEP, even when highly motivated.

## Contextual Factors

### The Thriving Informal PrEP Market

As discussed in the themes above, eighteen out of the 31 participants described aspects of an informal PrEP market (*Dài-Gòu*) that operates as an underground industry where individuals buy and sell imported generic PrEP on social networks, such as Twitter and WeChat. Seven of the ten PrEP-experienced participants had acquired PrEP this way, including one who had originally obtained PrEP through clinical trials and switched to informal channels after the trial. The other two participants engaged in PrEP clinical trials also indicated they would use *Dài-Gòu* to continue using PrEP after running out of the pills they had saved from the trial.

While increasing convenience and lowering costs, the informal PrEP market introduced challenges, including variation in the quality of PrEP care and reliability in consistent access to medication. The retail price of PrEP from informal sellers was typically much lower than that from licensed HIV clinics, and obtaining PrEP in this way was perceived as more convenient and private because in-clinic visits and lab tests were not required. For example, none of the six participants who had exclusively obtained PrEP through *Dài-Gòu* had received lab tests before initiating PrEP nor any follow-up assessment after initiating PrEP. The lack of clinical introduction or “onboarding” to PrEP for those who accessed the medication through informal channels also

contributed to uncertainty around the effectiveness of PrEP. A few participants ( $n=3$ ) mentioned not fully understanding how PrEP works even after obtaining the medication.

I know you need to take two ingredients for PrEP. I am curious about this – so the medications for pre-exposure and post-exposure are different. Is it (pre-exposure) really effective? (*GD19, 27 yrs, former PrEP user, PrEP source: Dài-Gòu*).

In addition to the inconsistent quality of PrEP care, *Dài-Gòu* also contributed to inconsistent access to medication. For example, the substantial reduction in international travel caused by the COVID-19 pandemic greatly impacted the supply chain of PrEP through informal channels — with some participants ( $n=2$ ) mentioning less availability. The informal *Dài-Gòu* market also negatively affected people's perceived efficacy of PrEP for HIV prevention as they were aware that these products are unregulated and their quality/legitimacy is not guaranteed.

### Sexual Minority Stress and “PrEP for All”

Sexual minority stress was common among participants, including stress from anticipated rejection from family and friends and anticipated discrimination in the workplace. Some ( $n=5$ ) shared concerns over political and cultural barriers to promoting PrEP in China, as HIV is often perceived as closely tied to the gay community that is rarely discussed or mentioned in public spaces. One participant shared how this societal discrimination could influence government support for PrEP:

Imagine that you are someone who has not been accepted and won't be in the future. We don't have a bright future anyway. How could you (think the government would provide free PrEP)? This is a huge requirement. Most people just “自暴自弃” (*Zì-Bào-Zì-Qì*, “give up oneself”, i.e., give up as hopeless) ... To be honest, I really want to know why you want to do this, like promoting PrEP in China? Because in China, first of all, the big environment is not good. Everything related to the (gay) community is very sensitive, very difficult. It's hard for me to imagine that you would succeed. (*GD23, 27 yrs, PrEP-naïve*).

When asked for their advice on promoting PrEP in China, some participants ( $n=5$ ) embraced the idea of framing PrEP as a tool for anyone at risk of HIV, not specifically targeting MSM:

Because for them (heterosexual individuals), sometimes, when they see this (PrEP and gay men being shown together), they would have a (negative) reaction. If they are friendly to us (gay men), they may think it's fine. If they don't like (gay men), they would



resist the drug (PrEP). They may think this drug is not for them. (*GD26, 26 yrs, intermittent PrEP user, PrEP source: Dài-Gòu*).

As suggested by this participant, branding PrEP as a medication for gay men may exacerbate the stigma around HIV and sexual orientation, ultimately making PrEP less acceptable to everyone — including MSM, mainstream audiences, and other populations at high risk for HIV.

## Discussion

This study documented numerous challenges to PrEP accessibility among MSM in China at individual, social, and structural levels. Our findings provide in-depth descriptions of perceived and experienced barriers and facilitators to PrEP uptake faced by Chinese MSM with and without PrEP-using experience. Guided by the IMB model, key information-related factors include a perceived lack of public messaging about PrEP that effectively conveys its prevention benefits and uncertainty about the efficacy of PrEP prevention against HIV. Motivation-related barriers were mainly about the perceived burden of PrEP (e.g., concerns over side effects, direct and indirect costs, and troubles in managing PrEP care), while facilitators focused on the benefits of PrEP for increasing the quality of sex and potential contribution toward reducing HIV stigma. Behavioral skills-related factors (including difficulties in identifying authentic PrEP medications and managing PrEP care routine) were also likely to be the end products of structural-level barriers: limited PrEP access via formal channels in China, a thriving informal PrEP market, and widespread minority stress among MSM. All these worked together and added challenges for MSM to experience benefits from using PrEP in HIV prevention.

The results suggest that uncertainty around PrEP safety and the perceived lack of public messaging about PrEP represent major information-related barriers to PrEP uptake among Chinese MSM. This mirrors previous survey studies reporting factors associated with PrEP uptake in Chinese and other cultural contexts [17, 18, 30, 31]. The policy and official communication vacuum before the official approval of PrEP in August 2020 likely fostered the spread of myths and stigmatizing information (e.g., PrEP association with risky sex and promiscuity) [32] and left people skeptical about PrEP [33, 34]. Our findings provide a strong rationale for promoting PrEP for all populations at risk of HIV and non-discriminatory PrEP advocacy strategies in China, where HIV stigma is interwoven with stigma toward sexual minority groups. A US-based study found that social policies aimed to benefit minority groups received less public support and slower advancement than those aimed at the general public or advantaged groups [35]. Similarly, marketing PrEP as a particular intervention for MSM may

exacerbate gay stigma and inadvertently discourage PrEP interest and use [35, 36].

Our findings also document the impacts of China's thriving informal PrEP market on MSM's motivation and ways to access formal PrEP (behavioral skills). When PrEP was unavailable through public health facilities, MSM found ways to access PrEP via informal channels, mainly *Dài-Gòu*. This phenomenon has been previously reported in other settings; before PrEP was officially approved or the generic PrEP was widely available, many people at risk of HIV in the USA, Europe, and other Asian countries turned to informal channels such as friend sharing, the street market of ART, and online pharmacies that sell PrEP without requiring a prescription [37–41]. These informal channels are often perceived as lower cost, more convenient, and non-judgmental to personal lifestyles [37]. However, they may also contribute to negative stereotypes about PrEP users as overly sexually active or promiscuous, as PrEP is often sold by informal buyers alongside other recreational drugs and sex toys. Furthermore, in this study, no participants who obtained their PrEP from *Dài-Gòu* received “standard-of-care” services before or after starting PrEP. Such informal use of PrEP could diminish both individual- and population-level benefits of PrEP through inappropriate use (e.g., by someone with HIV infection), insufficient adherence, and unmonitored side effects [40].

This paper offers several implications for future research and public health practitioners to promote PrEP in China. First, approaches are urgently needed to normalize PrEP messaging outside of HIV/STI-related locations like hospitals and clinics (e.g., adding PrEP into sex education curricula) and expand PrEP messaging within and beyond MSM-affiliated spaces [42]. Second, in addition to scaling-up PrEP delivery in traditional clinical settings, a multi-pronged strategy could invest in developing supplemental pathways for PrEP provision, such as through CBOs and legitimate online pharmacies [14, 43], to overcome MSM's anticipated and experienced multi-level barriers to initiation and maintenance. Third, cross-sectoral collaboration with policymakers, researchers, and practitioners is essential to expand accessible PrEP care, such as increasing insurance coverage of PrEP, investing in PrEP provider training, and integrating virtual and in-person intervention components for PrEP care.

This study has several limitations. First, the application of the IMB model focused the data interpretation primarily on individual-level factors. As we found, however, significant social- and structural-level barriers are operating as constraints on PrEP roll-out in China, such as the limited formal PrEP provision options, a large informal PrEP market, and lack of insurance coverage for PrEP. Second, eight out of ten of the PrEP-experienced participants were event-driven PrEP users, and their experiences may differ from those taking daily PrEP. Given participants' explanations of why they

were using event-driven PrEP (e.g., fear of toxicity, higher cost of daily PrEP, low reported sexual risk exposure), there may be a significant role for this dosing strategy that should be considered in future intervention development [44, 45]. Further study in this area is warranted — including a further in-depth understanding of any differences in barriers and facilitators among those using daily PrEP [46].

## Conclusion

This study identified themes to consider in further efforts to implement PrEP with MSM in settings like China, with delayed PrEP approval and low overall uptake. We identified the need to invest in positive and non-discriminatory public health messaging of PrEP, expand MSM-friendly provision of PrEP outside of traditional HIV clinics, and monitor the informal PrEP market. As the delivery forms of PrEP are evolving, it is critical for public health researchers and practitioners to develop interventions that reflect the lived experience among users of different PrEP strategies and offer tailored support to maximize PrEP uptake.

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**Data Availability** To ensure participants' privacy and confidentiality, research data can only be shared with eligible researchers who have obtained the necessary consent. If you meet the criteria for accessing the research data, you may request it from the UNC-Chapel Hill Institutional Data Access/Ethics Committee by contacting Chunyan Li at [chunyanli@alumni.unc.edu](mailto:chunyanli@alumni.unc.edu).

## Declarations

**Ethical Approval** All procedures performed in studies involving human participants were in accordance with the ethical standards of all institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. This study was approved by the Institutional Review Boards at the University of North Carolina at Chapel Hill (#19–3481), the

Southern Medical University Dermatology Hospital (#2020031), and the Guangzhou Eighth People's Hospital (#202022155).

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

**Conflict of Interest** The authors declare no competing interests.

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