

## iPARTY study: Increasing pre-exposure prophylaxis access and reach via telehealth for young men who have sex with men in Singapore 2022–2023

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### ABSTRACT

**Introduction:** Although pre-exposure prophylaxis (PrEP) has been available in Singapore since 2016, its uptake among gay, bisexual and other men-who-have-sex-with-men (GBMSM) is low. The iPARTY study was established to evaluate the acceptability and feasibility of PrEP and a PrEP teleconsultation service for young GBMSM aged 18 to 29 years.

**Method:** A total of 53 young GBMSM were enrolled in the iPARTY study. They had a total of 5 in-person consultations and teleconsultations, at 12-week intervals. Laboratory tests and quarterly baseline surveys were performed to assess PrEP adherence, sexual behaviour, and incidence of human immunodeficiency virus (HIV) and other sexually transmitted infections (STIs).

**Results:** Thirty-five participants completed the entire 12-month follow-up. Most participants had positive experiences with PrEP teleconsultations. There was a statistically significant fall in participants' aggregate Patient Health Questionnaire-9 scores throughout the study. Self-reported PrEP adherence decreased over the course of the study, denoting improved mental health. Although self-reported condom use for anal intercourse and participants' risk perception of HIV decreased after PrEP adoption, there was no statistically significant increase in STI incidence.

**Conclusion:** This pilot project has shown that PrEP services provide an opportunity for YMSM to access sexual health testing, treatment and counselling, and may even have tangible benefits on the mental health of this population. Teleconsultation is shown to be a suitable platform for the delivery of such services. Collaborative initiatives are crucial to further enhance the affordability and accessibility of PrEP in Singapore, and to improve patient adherence.

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**Keywords:** HIV, infectious diseases, pre-exposure prophylaxis, STI, young MSM

### CLINICAL IMPACT

#### What is New

- This pilot study is the first to evaluate the acceptability and feasibility of pre-exposure prophylaxis (PrEP) provision via teleconsultation for young men who have sex with men (YMSM).

#### Clinical Implications

- The study demonstrates that teleconsultation for PrEP services is practical and well-received by YMSM, providing a foundation to support broader implementation.
- These findings offer guidance to expand PrEP accessibility and enhance sexual health services for this population.

### INTRODUCTION

Human immunodeficiency virus (HIV) infection remains a significant global health challenge worldwide, with 39 million people living with HIV as of 2022.<sup>1</sup> In Singapore, there were 209 newly diagnosed cases of HIV infections in 2023, a 3% increase from 2022.<sup>2</sup> Although highly active antiretroviral therapy (HAART) effectively suppresses viral replication, lifelong treatment is required.<sup>3,4</sup> Even with HAART, people living with HIV are more susceptible to various long-term comorbidities, including cardiovascular disease, diabetes, frailty and cognitive disorders.<sup>5</sup>

Without an effective cure, preventive measures to avoid contracting HIV are imperative. Pre-exposure prophylaxis (PrEP), which involves the use of

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antiretroviral drugs before potential HIV exposure, is one such measure.<sup>6,7</sup> Although PrEP services have been available in Singapore since 2016, PrEP uptake among gay, bisexual and other men who have sex with men (GBMSM) has been slow; in a 2023 report, although PrEP awareness was high in this population (93.0%), only a minority (25.0%) of those who had heard of PrEP were current PrEP users.<sup>8</sup> PrEP usage among young men who have sex with men (YMSM) is often even lower than their older counterparts, partially due to their financial limitations. Furthermore, YMSM may benefit from PrEP more than their older counterparts;<sup>9</sup> the former are particularly at risk due to their higher rates of risky sexual behaviours, substance use related to sexual activities, and barriers to accessing healthcare services.<sup>10,11</sup>

Hence, the iPARTY study was conducted, with the aim to establish and pilot a 1-year clinical cohort of 50 YMSM aged 18 to 29 in Singapore to assess the delivery, acceptability and feasibility of daily PrEP, as well as a PrEP teleconsultation service for YMSM. There are also concerns that PrEP utilisation could result in an increase in high-risk sexual behaviours, such as condom-less sexual intercourse, having multiple partners, or not discussing STI statuses, due to a perceived lower risk of HIV infection.<sup>12,13</sup> This is known as risk compensation, and could result in a corresponding increase in other STIs.<sup>14</sup> Therefore, our study further assessed the sexual practices and STI incidence of participants to evaluate this phenomenon. Counselling on sexually transmitted infection (STI) and risk compensation was also performed concurrently with PrEP provision.<sup>15</sup>

## METHOD

### Participant recruitment

Between June 2021 and 2022, 53 participants were enrolled in the study. Inclusion criteria were Singaporean citizen or permanent resident; assigned male at birth (cisgender man or transgender woman); aged 18 to 29 years; HIV-negative (self-reported at enrolment); self-reported sexual intercourse with men and any of the following risk factors for HIV infection in the past 12 months: (1) self-reported condomless anal sex; (2) diagnosis of 1 or more STIs; (3) self-reported use of recreational drugs during sexual activities. The exclusion criteria included the following: unable to provide informed consent; a positive HIV diagnosis; contraindications to the use of the tenofovir disoproxil fumarate (TDF)/emtricitabine (FTC) co-formulation for PrEP, including those with impaired kidney function (estimated creatinine clearance, or CrCl < 50 mL/min) and those with active Hepatitis B.

Prospective participants were approached by study team members from Action for AIDS (AfA Singapore), a community-based organisation in Singapore that provides sexual health services to YMSM, who assessed participants' eligibility and willingness to participate using a standardised script. For those keen to participate, written informed consent was obtained in a private, confidential setting at National Centre for Infectious Diseases, Singapore (NCID). To ensure anonymity, all participants were issued unique participant identification numbers, which would become the sole means of identification throughout the study; only the HIV physician and the study coordinator would have access to participants' identities. All consultations, tests and generic daily PrEP were provided at no cost to the participants; participants only needed to pay nominal fees for medication delivery, if required.

This study received funding from the NCID Catalyst Fund 2021/2022 and was approved by the National Health Group Domain Specific Review Board (2021/00810).

### Investigations

To determine eligibility, tests for hepatitis B surface antigen (HBsAg) and hepatitis B surface antibody (anti-HBs) were conducted at the first visit. Serum creatinine was also measured at the beginning of the study and again at 24 weeks to assess eligibility and tolerability, respectively.

STI screening was performed 5 times throughout the study, with intervals of 12 weeks between each assessment. Tests included a rapid fourth-generation HIV test, rapid syphilis test and polymerase chain reaction (PCR) testing for *Neisseria gonorrhoeae* and *Chlamydia trachomatis* using a urine sample.

Participants with positive HIV tests were withdrawn from the study and referred to a specialist HIV care centre for further care. Participants who tested positive for syphilis, gonorrhoea or chlamydia were also referred to an appointed sexual health centre for appropriate treatment but were not withdrawn from the study.

### Consultations

Participants attended a total of 5 consultations, at 12-week intervals, with an infectious disease physician who was also a member of the study team. The first and fifth consultations were conducted in-person, and the others were teleconsultations performed over Zoom platform (Zoom Video Communication, San Jose, CA, US), a secure video-conferencing platform with Advanced Encryption Standard 256-bit encryption, user authentication

and audit trails. These measures complemented institutional IT policies, including password protection for laptops and electronic medical records, malware protection and strict controls on patient data access.

At these consultations, participants' test results would be reviewed. Participants also received counselling on the use of daily HIV TDF/FTC PrEP, in accordance with Singapore's National HIV Programme's PrEP Guidelines,<sup>15</sup> with the following information: (1) that TDF/FTC taken daily has an efficacy of up to 96% in preventing HIV infection in at-risk individuals, if taken as prescribed; (2) that a lead-in period of 14 days is necessary before full protection is achieved, and all sexual intercourse during this lead-in period should be protected with condom use; (3) that PrEP is only effective in

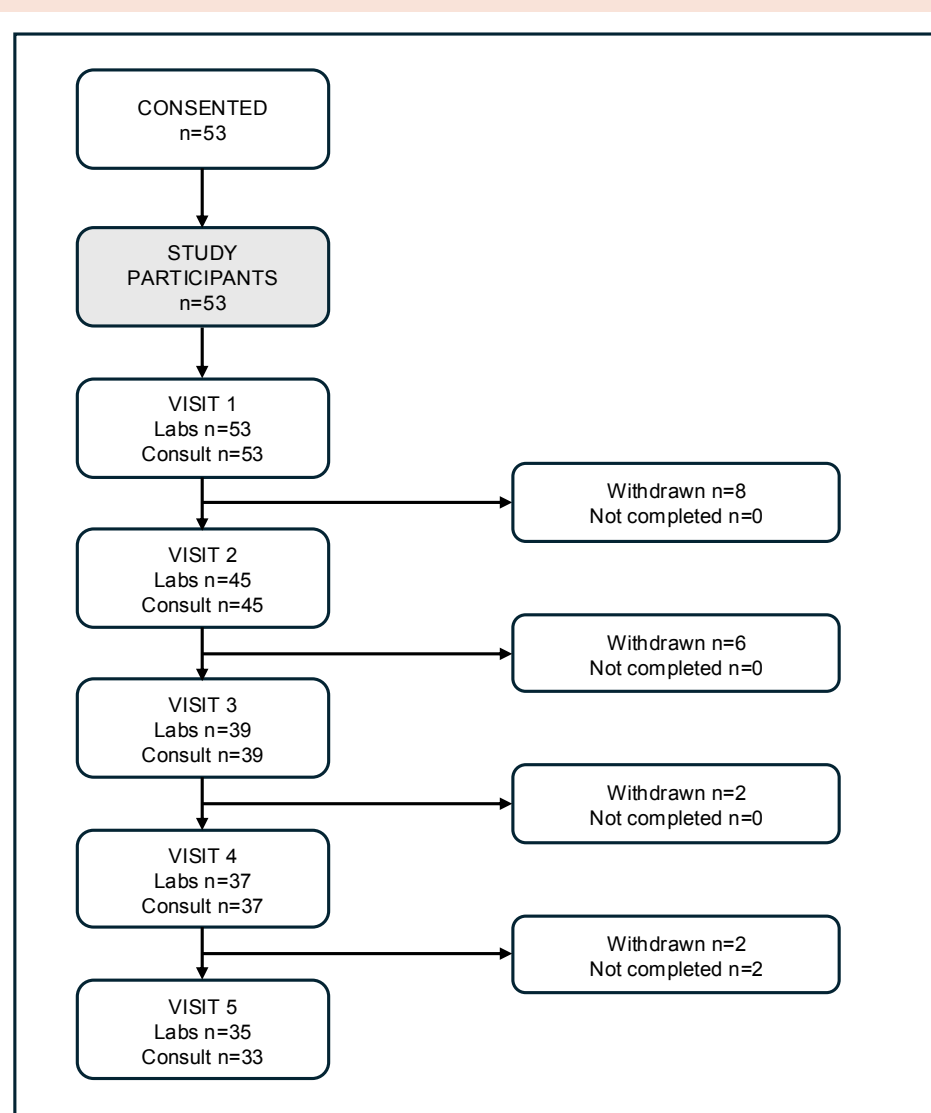
preventing HIV infection, and precautions should still be taken to prevent infection with other STIs. At the end of the consultation, participants were given a prescription to purchase their medications from institutional pharmacies or from recommended online sources.

After completing the study, participants were offered the option to continue PrEP follow-up at either the NCID or the Department of Sexual Health Clinic (DSC), a local STI specialist outpatient clinic.

### Questionnaires

Three different questionnaires (Supplementary Appendices 1–3) were given to the participants throughout the study, to assess the following: general demographics; sexual outcomes and behaviours; substance use; HIV/STI testing beha-

Fig. 1. Flow diagram for participant recruitment and retention (n=53).



viours; HIV risk perception and complacency; mental health screen, including the Patient Health Questionnaire-9 (PHQ-9), the 12-item HIV stigma scale, and questions on anticipated PrEP stigma, adapted from Calabrese et al.;<sup>16–18</sup> self-reported adherence to PrEP using questions adapted from a study by Blumenthal et al.;<sup>19</sup> and telehealth experience.

### Statistical analysis

Statistical analyses were performed using Microsoft Excel 2023 (Microsoft Corporation, Redmond, WA, US). Continuous variables were summarised as mean  $\pm$  standard deviation (SD), or median and range, as appropriate. For categorical variables, frequencies and percentages were reported.

Student's t-test was used for statistical analysis of continuous variables, and the chi-square test was used for categorical variables, where appropriate. A *P* value of  $<0.05$  was considered statistically significant.

## RESULTS

Between June 2021 and June 2022, 53 participants were enrolled in the study. Among them, 62.3% (33/53) of the participants completed the entire 12-month follow-up, and 66.0% (35/53) were able to complete all the surveys (2 participants missed their final doctor's appointment) (Fig. 1). Of the 20 participants who dropped out of the study, 10 were uncontactable, 3 were "busy and unable to commit", 2 were "overseas and unable to commit", 2 were "no longer interested," 1 felt that "medication delivery was inconvenient," 1 felt that there was "no urgent need to start PrEP as [he] feels he is not high-risk", and 1 seroconverted prior to PrEP initiation and was no longer eligible.

### Demographics

The mean age of the cohort was  $24.2 \pm 2.99$  years, with the majority of participants being of Chinese ethnicity (37 participants; 69.8%), followed by Malay (12 participants; 22.6%) and Indian (4 participants; 7.6%). All participants had at least secondary school education, with 37.7% (20/53) of participants having completed university education. Among the participants, 75.5% (40/53) lived in public housing and 24.5% (13/53) lived in private housing, with a median income range of SGD 1000 to 2999. Single participants comprised 86.8% (46/53) of the cohort, while 9.4% (5/53) had 1 partner, and 3.8% (2/53) had multiple male partners.

Among the cohort, 90.6% (48/53) were first-time PrEP users. Comparing the participants who completed all study surveys ( $n=35$ ) against those

that defaulted ( $n=18$ ), there was a statistically significant difference in age (defaulters:  $23.2 \pm 2.23$ ; non-defaulters:  $24.7 \pm 3.21$ ;  $P<0.05$ ) and relationship status (defaulters: 78% single, 22% attached; non-defaulters: 91% single, 9% attached;  $P<0.05$ ). While the  $P<0.05$  result suggested that the age difference is statistically significant, it is unlikely to be clinically or practically relevant based on the small magnitude of the difference. There were no statistically significant differences in ethnicity, education level, income or housing type ( $P>0.05$ ).

### PrEP adherence

There was a significant decrease in self-reported PrEP adherence among participants consistently taking 7 pills per week, with the adherence rate declining from 55.6% at the second visit to 37.1% at the fifth visit ( $P<0.05$ ) (Fig. 2A). Notably, by the second visit, only 30% of the defaulters ( $n=20$ ) reportedly took 7 pills a week, compared to 62.9% of those who completed the study ( $n=33$ ) ( $P<0.05$ ) (Fig. 2B).

### Sexual practices

As the study progressed, changes in participants' sexual practices were observed. At the first visit, 60.4% of participants had 6 or more sexual partners. This decreased to 42.9% at the fifth visit ( $P<0.05$ ) (Fig. 3A). However, there was a reduction in reported condom use for anal intercourse with both regular and casual partners, from 28.3% to 11.4% for regular partners ( $P<0.05$ ), and from 56.6% to 28.6% for casual partners ( $P<0.05$ ) (Fig. 3B).

### Substance use

There was a decrease in the percentage of participants who used substances (e.g. alcohol, poppers, Viagra [sildenafil citrate], etc.) during sex activities, from 60.4% at the first visit to 45.7% at the fifth visit. However, this was not statistically significant ( $P=0.076$ ).

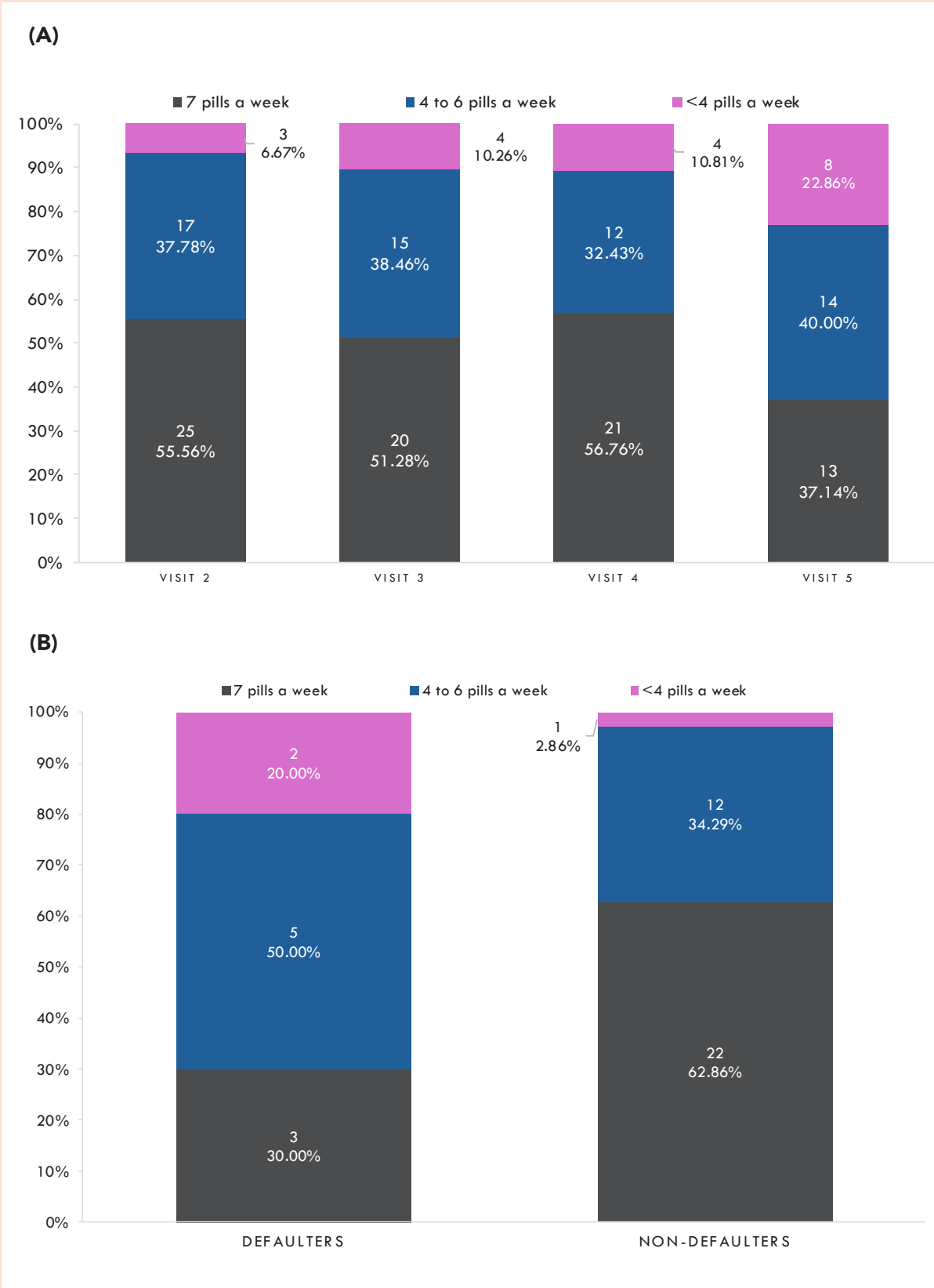
### Sexually transmitted infections

An increase in STI incidence was observed after PrEP initiation among participants, from 18.9% (10/53) at the first visit to 28.6% (10/35) at the fifth visit. STI cases, such as chlamydia, gonorrhoea and syphilis were self-reported by participants. The breakdown of self-reported STIs from the first to the fifth visit is shown in Table 1.

### Risk perception

From the first to the fifth visit, there was an overall decrease in participants' risk perception of HIV. At the first visit, 69.8% of participants agreed that "HIV was a less serious threat than it used to be";

Fig. 2. Defaulters versus non-defaulters.



(A) Self-reported PrEP adherence from visits 2–5; (B) Self-reported PrEP adherence at visit 2 (defaulters versus non-defaulters).

Fig. 3. Changes in sexual practices.



(A) Number of sexual partners (visits 2–5); (B) Condom use when having anal sex with regular versus casual male partner(s) in the last 6 months.

Table 1. Cumulative incidence of sexually transmitted diseases from visits 1–5, no. (%).

| STIs               | Visit 1   | Visit 2   | Visit 3   | Visit 4   | Visit 5    |
|--------------------|-----------|-----------|-----------|-----------|------------|
| Chlamydia          | 4 (7.55%) | 6 (1.33%) | 4 (1.03%) | 3 (8.1%)  | 6 (17.14%) |
| Gonorrhoea         | 2 (3.77%) | 2 (4.44%) | 5 (1.28%) | 5 (13.5%) | 3 (8.57%)  |
| Syphilis           | 1 (1.89%) | 1 (2.22%) | 1 (2.56%) | 1 (2.70%) | 1 (2.86%)  |
| Genital herpes     | 0         | 0         | 0         | 0         | 0          |
| Genital warts      | 2 (3.77%) | 0         | 0         | 0         | 0          |
| Others             | 1 (1.89%) | 0         | 0         | 1 (2.70%) | 0          |
| Total participants | 53        | 45        | 39        | 37        | 35         |

STIs: sexually transmitted infections

this increased to 88.6% at the fifth visit ( $P<0.05$ ). There was also a significant increase in the percentage of participants who agreed that they “practised safe sex less often due to advancements in medical treatment for HIV/AIDS”, from 16.4% at the first visit to 48.6% at the fifth visit ( $P<0.05$ ).

### Mental health screen

There was a statistically significant fall in participants’ aggregate mean (SD) PHQ-9 scores from the first visit ( $17.7 \pm 3.54$ ) to the fifth visit ( $13.1 \pm 3.04$ ) ( $P<0.05$ ), indicating an overall improvement in mood. There were no significant temporal differences in the aggregated scores for either the HIV Stigma Scale or the PrEP Stigma Scale.

At the first visit, the PHQ-9 scores of the participants who defaulted the study ( $16.3 \pm 3.38$ ) were noted to be lower than the PHQ-9 scores of those who completed the study ( $18.3 \pm 3.46$ ) ( $P<0.05$ ). There were no significant differences in the aggregated scores for either the HIV Stigma Scale or the PrEP Stigma Scale between the defaulters and non-defaulters.

### Telehealth experience

Overall, participants had positive feedback about the telehealth experience; at the fifth visit, 80% of participants either agreed or strongly agreed that they had had positive experiences with PrEP teleconsultations. All participants agreed that their questions and concerns could be addressed adequately by doctors via teleconsultation.

## DISCUSSION

This pilot project has shown that telehealth services can significantly improve PrEP uptake among YMSM. Prior to the study, only 9.6% of the surveyed YMSM were taking PrEP, which was even lower than the overall PrEP uptake of 25% in the 2023 Singaporean study.<sup>8</sup> By the end of the study,

despite some defaulters, 62.3% of participants continued to take PrEP and attend follow-up PrEP appointments.

While PrEP provision has demonstrated its benefits, there was a significant decrease in self-reported PrEP adherence among participants throughout the study. Key barriers to PrEP adherence previously identified include forgetting to take PrEP daily, not wanting to take a chemical substance for a prolonged period, and low perceived vulnerability to HIV.<sup>20</sup> Changes in lifestyle and relationship status could also result in a diminished need for PrEP.<sup>21</sup>

PrEP providers must thus emphasise the importance of consistent PrEP use at each consultation, and provide education on prevention-effective PrEP adherence.<sup>22–25</sup> To address the key barriers identified, digital platforms can be leveraged to increase adherence, especially among the younger, tech-savvy population.<sup>26</sup> For instance, medication reminders via mobile applications can increase PrEP adherence among YMSM by developing medicine-taking habits, especially when first commencing PrEP.<sup>27,28</sup> Further providing incentives for good adherence may also improve retention in PrEP programmes.<sup>29</sup> Peer navigators can also be engaged, to address individual barriers to PrEP and provide peer motivation.<sup>30</sup>

PrEP may also offer significant psychological benefits for recipients. A statistically significant decrease in PHQ-9 scores from the first to the last visit indicates an overall improvement in mental health after starting PrEP. A few mechanisms have been proposed for this positive change. First, PrEP may alleviate the fear of HIV infection, providing reassurance for PrEP users.<sup>31</sup> Second, PrEP could independently lead to better sexual satisfaction, ultimately culminating in greater life satisfaction.<sup>32</sup> However, maintaining adherence to PrEP regimens can introduce stress, particularly for those concerned

about the consequences of missed doses. Some younger participants also felt that taking PrEP could negatively impact how others perceive them. This perception was particularly common among younger individuals and those who were more psychologically vulnerable, as reflected by lower self-esteem scores and higher depression scores, which could, in turn, affect PrEP adherence.<sup>33</sup> Additionally, the high initial PHQ-9 scores observed in the study, with many participants showing moderately-severe depression, suggest potential benefits to integrating routine mental health screening into PrEP services, to identify and address mental health challenges in this vulnerable population early.<sup>34</sup>

Participants also did not partake in regular STI testing prior to this study. However, STI screening conducted during the study revealed that many individuals tested positive for various STIs. Additionally, 1 individual was found to have sero-converted at the start of the study, prior to PrEP initiation. Therefore, expanding PrEP services, along with accompanying STI tests, could be highly beneficial for the early detection and treatment of STIs, including HIV, in this at-risk population.

The study also highlighted concerns that, despite the benefits, PrEP uptake may lead to riskier sexual practices. Although counselling was provided during PrEP consultations, there was still a statistically significant reduction in reported condom use for anal intercourse. Nevertheless, while PrEP provision could lead to riskier sexual practices that confer a high risk of acquiring STIs, the incidental detection and treatment of these STIs as part of PrEP provision, and the benefits of HIV prevention may partially offset risk compensation.<sup>35,36</sup>

Nevertheless, in the provision of PrEP services, it is essential for clinicians to continue emphasising that PrEP does not prevent other STIs, and to recommend concurrent condom use with PrEP use, which is consistent with national PrEP Guidelines.<sup>15,37</sup> Recently published cases of PrEP failure in Singapore further underscore the critical importance of risk counselling and adherence to PrEP to maintain its efficacy, as these cases were patients on self-directed PrEP, who had adherence issues.<sup>38</sup>

This study has several limitations. First, the cost for PrEP and associated investigations were borne by the study. Eventually, barring policy changes, the participants will have to pay out-of-pocket to continue receiving PrEP services. This financial aspect may deter consistent PrEP usage, especially given the relatively low median income range (SGD 1000 to 2999) among the surveyed YMSM population. Second, the reasons for defaulting were not always fully explored, as some defaulters become uncon-

tactable; such information could provide valuable insights into improving PrEP services. Third, the small sample size in this study limits its statistical power, making it difficult to detect significant effects. There are also potential selection biases, as the population, recruited at STI testing sites from community-based organisations, could have greater familiarity, knowledge and awareness of PrEP than the broader population of YMSM, reducing generalisability. Future studies should be conducted on a larger scale to validate the findings of this pilot study. Finally, while this pilot study focused solely on daily PrEP, future studies could focus on other modalities of PrEP delivery. In particular, on-demand PrEP could be an alternative for individuals poorly adherent to daily PrEP.<sup>39</sup> Recently, novel long-acting, extended-delivery injectable PrEP formulations have demonstrated excellent outcomes, offering potential to enhance adherence.<sup>40,41</sup>

## CONCLUSION

In conclusion, this study demonstrates that PrEP services provide an opportunity for YMSM to access sexual health testing, treatment and counselling, and may even have a positive impact on their mental health. Telemedicine has proven to be a suitable platform for the delivery of such services. Given these immense benefits of improving PrEP uptake, top-down policy changes should be implemented in Singapore to scale up PrEP initiatives, enhancing both its affordability and accessibility. This would serve the public good and better protect the vulnerable YMSM population. While clinicians should emphasise the effectiveness of PrEP in preventing HIV, individuals using PrEP must remain aware that it does not protect against other STIs; engaging in risky sexual behaviours while on PrEP may still increase their vulnerability to these infections.

## Supplementary Table S1

## Supplementary Appendices 1–3

### Ethics statement

*Patient consent was sought for this study. This study received funding from the NCID Catalyst Fund 2021/2022 and was approved by the National Healthcare Group Domain Specific Review Board (2021/000810).*

### Declaration

*The authors have no affiliations or financial involvement with any commercial organisation with a direct financial interest in the subject or materials discussed in the manuscript.*

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