

HIV pre-exposure prophylaxis preparedness among men who have sex with men (MSM) in Myanmar

A survey of service-engaged MSM in Yangon and Mandalay

Prepared by:

Centre for Population Health and Centre for International Health
Burnet Institute
85 Commercial Rd
Melbourne, Victoria 3004
AUSTRALIA

Burnet Institute Myanmar
No.226, 4d Floor, Winzaya Plaza
U Wisara Road,
Bahan Township, Yangon
MYANMAR

Contributors:

Mark Stoové, Zaw Min Oo, Bridget Draper, Chad Hughes, Vanessa Veronese, Thet Tin Tun, Poe Poe Aung, Zaw Win Thein, Ei Mon Khine, Kyaw Moe Lwin, Myo Thant, Kyaw Soe, Claire Ryan and New New Oo

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Executive summary

Introduction

Pre-exposure prophylaxis (PrEP) – the use of HIV antiretroviral (ARV) treatment by HIV-negative individuals to reduce their risk of acquiring HIV - is now recognised as an emerging and fundamental biomedical component of combination HIV prevention approaches. A series of recent randomised controlled trials and open label extension studies have unambiguously demonstrated the efficacy of daily PrEP in preventing HIV among at-risk individuals, including men who have sex with men (MSM). In 2014, the World Health Organization (WHO) recommended PrEP for HIV prevention for MSM as part of a comprehensive HIV prevention package. In 2015, the WHO expanded this recommendation to include all people at substantial risk of HIV.

With an estimated HIV prevalence of 6.6%, MSM in Myanmar continue to be disproportionately affected by HIV. Against a backdrop of real and perceived criminalisation, stigma and discrimination, including by health services and their staff, MSM face a number of structural and systemic barriers that affect their access to and utilisation of HIV prevention services and exacerbate their risk of HIV infection.

The effectiveness of PrEP is highly dependent upon adherence to taking the drug and the safe dispensing of PrEP relies on regular engagement with health services by those using PrEP. The effectiveness of PrEP for HIV prevention is therefore contingent upon the capacity of local health systems and potential barriers to health-seeking behaviour among those at risk of HIV, including stigma and marginalisation. The level of acceptability of PrEP among HIV risk populations is also a key consideration. Previous studies have illustrated varying levels of acceptability for PrEP across a wide range of settings.

To assess the potential utility of PrEP as part of local HIV prevention strategies, it is important to first assess the acceptability of PrEP among HIV risk populations and understand the individual- and population-level factors likely to influence PrEP acceptability and uptake.

Study

In December 2014, a survey was administered to MSM in Myanmar as part of research undertaken by the Burnet Institute (BI) and the Myanmar Business Coalition on AIDS (MBCA). This survey assessed the level of acceptability of PrEP and factors associated with willingness to take PrEP, and explored considerations for potential PrEP implementation in Myanmar.

The quantitative survey was administered by BI/MBCA peer educators and field researchers to MSM recruited through snowball and convenience sampling strategies at known MSM hotspots in Yangon and Mandalay. Participants' eligibility was assessed using the following criteria: aged 18 years or over; self-reported MSM; able and willing to provide informed consent; presented with a study card and had not previously participated in the study.

After receiving information about the key attributes of PrEP, MSM were asked to respond to a validated PrEP acceptability scale that asked for responses to seven Likert-scaled statements about their willingness to use PrEP. Aggregate scores from these seven statements categorised MSM as either 'willing' or 'unwilling' to use PrEP. Logistic regression was used to identify factors associated with finding PrEP acceptable. Descriptive statistics assessed potential barriers to uptake among those classified as finding PrEP acceptable. All analysis was conducted with Stata (Version 13.1)

Results

A total of 520 MSM completed the survey; 293 (56%) in Mandalay and 227 (44%) in Yangon. Overall, the sample was young (median age of 24 years), well-educated, most identified as *Thange* (gender normative) MSM, and had an average monthly income of 130,000 MMK. Two thirds reported at least one regular male partner and almost three quarters (72%) reported two or more casual partners in the past three months. Approximately half (54%) of MSM with regular partners and almost three quarters (74%) of MSM with casual partners reported often or always using condoms with these partner types. Two thirds of MSM reported they did not know their partner's HIV status. MSM appeared to have good access to HIV testing, with approximately two thirds (67%) reporting their last HIV test was in the past six months. Thirteen percent self-reported an HIV-positive status.

Only five percent of MSM were aware of PrEP prior to the study. Following an explanation of the attributes of PrEP (e.g., efficacy, dispensing, adherence, side-effects) by researchers, 39% of HIV negative MSM were classified as willing to use PrEP, with no significant differences seen between MSM recruited in Yangon and Mandalay. MSM who reported only one regular male partner and those who were concerned about possible side-effects and long-term use of PrEP were significantly less likely to be classified as willing to use PrEP. MSM who never or only occasionally used condoms with casual partners were significantly more likely to be classified as willing to use PrEP.

Among MSM categorised as willing to use PrEP, the most commonly reported barriers to HIV testing were those related to the convenience of testing, such as limited time, location of services and opening hours.

Barriers related to fear of disclosure of HIV status and stigma were also reported. When asked about level of comfort with different HIV testing models, most MSM expressed a high degree of comfort with receiving testing from trained peers and male staff, while more than half were uncomfortable about receiving testing from a female provider. Almost all MSM indicated a preference for HIV testing at non-government organisations (NGOs).

Discussion

The level of acceptability for PrEP found in this study is similar to levels found in neighbouring Thailand. The majority of participants had a HIV testing history and tested recently, suggesting a high level of engagement with HIV prevention services - a necessary component of an effective PrEP programme. Moreover, the high level of comfort with testing at NGOs and by peer providers suggest the advantages of community-based and peer-involved HIV service models in Myanmar can be effectively leveraged for PrEP programmes to overcome barriers related to stigma and discrimination often experienced within clinical and hospital environments.

The sexual risk behaviours reported by this sample suggest their suitability for PrEP as a population at substantial risk of HIV exposure. However, concerns about potential side-effects and limited knowledge of PrEP demonstrate the need for community engagement and education alongside any future roll-out of PrEP.

Conclusion

With 39% of MSM in this study classified as willing to use PrEP and high rates of recent HIV testing, PrEP may be a viable addition to comprehensive HIV prevention strategies for MSM in Myanmar. The recent decentralisation of Myanmar's health system has seen HIV testing and other services increasingly offered through NGOs and recent investments in the implementation and maintenance of accessible HIV services for MSM may offer an important foundation for PrEP programmes. Demonstration or implementation projects that examine the effectiveness of PrEP in a real life setting, including identification of issues related to drug adherence and logistics associated with PrEP dispensing and monitoring, will be an important next step to guide any future implementation of PrEP in Myanmar.

Section 1: Introduction

The prevention of HIV globally is now focussed on combination prevention. Combination prevention includes the simultaneous and comprehensive use of primary behavioural prevention (e.g., using condoms and clean injecting equipment), local structural and policy change that supports an effective HIV prevention environment (e.g., addressing stigma and decriminalisation of risk practices, health system reform) and biomedical prevention strategies^(1,2).

Biomedical prevention approaches include therapeutic treatment as prevention (TasP) - the early initiation of antiretroviral (ARV) treatment for viral suppression and reduced risk of onward transmission - and pre-exposure prophylaxis (PrEP) - the prophylactic use of ARV drugs by HIV negative individuals to reduce their risk of HIV acquisition⁽¹⁾. Recent randomised controlled trials have demonstrated that daily oral administration of PrEP reduces HIV transmission risk considerably among men who have sex with men (MSM)⁽³⁾, heterosexual men and women⁽⁴⁻⁸⁾ and people who inject drugs (PWID)⁽⁹⁾ when combined with other HIV prevention methods such as condoms. While these clinical trials have clearly demonstrated the prevention efficacy of PrEP, open label extension studies, demonstration projects and clinical practice observational studies have further demonstrated PrEP as a highly effective HIV prevention tool among MSM^(6, 10-13). However, findings from both controlled and observational PrEP trials among MSM underscore the importance of adherence to PrEP medications, ongoing risk reduction counselling and condom reinforcement as crucial for effective prevention⁽¹¹⁾. Given this evidence, the World Health Organization (WHO) has recommended the inclusion of daily PrEP as a part of a comprehensive HIV prevention strategy for MSM globally^(1,14). PrEP is currently only approved in the US⁽¹⁵⁾, and more recently in France, with regulatory authorities in several other countries currently considering applications for the licensing of PrEP.

Considerations for PrEP Implementation

There are many local factors that need to be considered when planning the potential implementation of PrEP programmes. The anticipated cost of PrEP and the models used to support PrEP dispensing need to be balanced against other HIV-specific and general health resource needs. The strategic allocation of HIV-related resources is a priority consideration in resource-limited settings with sub-optimal ARV treatment coverage for those living with HIV. While the merits of resourcing ARV dispensing for prevention rather than treatment in such settings is debated, local stakeholders need to consider the potential population-level prevention benefits of PrEP and the future HIV burden of disease averted and the impact this may have on future ARV treatment coverage.

Variations in local epidemiological and socio-political contexts of HIV will also influence the potential effectiveness of PrEP programmes⁽¹⁶⁾ and it is vital that countries considering PrEP as part of a comprehensive HIV prevention strategy take account of the broader social context of HIV and the primary at-risk populations. This is especially the case where clustered HIV epidemics exist in populations who have historically experienced high levels of stigma, discrimination and marginalisation, including sex workers, PWID, transgender people and MSM. Fear of stigma was raised as an issue in a number of PrEP studies, both in terms of HIV-related stigma^{e.g.,(11, 17-22)} and HIV co-characteristic stigma related to fear of being seen as belonging to a high-risk group such as MSM^{e.g.,(11, 17, 20, 23)}. Community-based programmes designed to address potential stigma among PrEP users should be considered^(2, 24), alongside careful consideration of the types of service models that are used to implement PrEP programmes. Implementing PrEP programmes through services that are likely to engender trust from the target HIV risk population and are seen as “safe” environments will be crucial to facilitating programme reach, PrEP adherence and ultimately the prevention effectiveness of PrEP programmes.

Because PrEP is a clinical intervention, the preparedness of local health systems to safely deliver PrEP to those at risk of acquiring HIV needs to be considered. Clinical and prevention PrEP guidelines^{e.g.,(25)} include the need for regular monitoring of individuals taking PrEP for side-effects. Minor to moderate side-effects associated with the use of PrEP, such as headaches, nausea^(3, 12), weight loss⁽¹⁰⁾, modest bone density loss^(26, 27) and minor kidney problems^(3, 28, 29) have been identified but tend to resolve by temporarily ceasing PrEP use. The potential use of PrEP by people with undiagnosed HIV infections has raised concerns related to the potential emergence of drug resistant strains of HIV. This risk can be best mitigated by testing for HIV before commencing PrEP, optimising adherence to PrEP and regular HIV testing whilst taking PrEP^(30, 31). It has also been suggested the implementation of PrEP will lead to the emergence of fewer drug resistant HIV infections than would occur without PrEP being available to avert new infections⁽³²⁾. To date, drug resistance in patients who seroconvert has been very rare^(10, 12, 33).

The necessity for clinical monitoring (e.g., regular HIV diagnostic and renal function tests) of people using PrEP means appropriate healthcare systems and infrastructure need to be available and accessible to ensure PrEP programmes can be delivered in accordance with clinical and prevention guidelines^(2, 25). To be effective, PrEP service models must also meet the psychosocial needs of target populations, especially in the context of stigma and marginalisation, as described above. Significant HIV-related stigma and discrimination experienced in clinical and healthcare environments by people with or at risk of HIV, acts as a deterrent to accessing services and has been identified as a major barrier to HIV care and prevention programme effectiveness^(34, 35).

PrEP Acceptability

For PrEP to be an effective population-level HIV prevention strategy it has to be accessible and acceptable to the primary HIV risk population. PrEP acceptability studies among MSM have been conducted in high-income countries such as the UK⁽³⁶⁻³⁸⁾, the Netherlands⁽³⁹⁾, Portugal⁽⁴⁰⁾, Australia^(41, 42), Canada⁽⁴³⁻⁴⁵⁾ and the US^{e.g., (46-50)}, as well as low- and middle- income countries such as China^(22, 51, 52), Thailand⁽⁵³⁻⁵⁵⁾, India⁽⁵⁶⁾, Peru^(57, 58), Brazil^(59, 60), South Africa⁽⁵⁶⁾, and Kenya⁽⁵⁶⁾. The proportion of MSM reporting PrEP as an acceptable HIV prevention option has varied considerably across studies in high-income countries (from 13% in the Netherlands⁽³⁹⁾ to approximately 75% in the US⁽⁵⁰⁾) and low- and middle-income countries (from 35% in Thailand⁽⁵³⁾ to 96% in Peru⁽⁵⁸⁾). Research findings on PrEP acceptability are, however, likely to be affected by different study protocols, including descriptions of the attributes of PrEP (e.g., effectiveness, side effects) given to participants, the acceptability measurement tool used (e.g., single item questions versus multiple questions related to the attributes and context of PrEP) and participant recruitment methods. Nevertheless, in some countries, studies using differing explanations of PrEP, measurement tools and recruitment methods have obtained similar PrEP acceptability results. Three studies in Thailand that used varied recruitment methods and descriptions of PrEP in regards to side-effects and effectiveness reported PrEP acceptability among 35% to 41% of participants⁽⁵³⁻⁵⁵⁾. Similarly, studies in China using varied recruitment methods and measurement tools report relatively consistent PrEP acceptability levels ranging from 63% to 68%^(22, 51, 52).

In previous literature, a number of factors were associated with PrEP acceptability among MSM. Research findings in low- and middle-income settings show PrEP acceptability is sensitive to descriptions of cost, efficacy, safety, side-effects and long-term use, dosing frequency and time spent obtaining PrEP, and dispensing venues and people involved in dispensing^(22, 52, 54, 57). Potential recipients of PrEP in the multi-site iPrEx open label extension study also reported concerns about side-effects as a reason for not taking PrEP⁽¹¹⁾. Findings from clinical trials, open label extension studies and demonstration projects also showed that not being concerned about or not experiencing side-effects was associated with greater PrEP adherence⁽⁶¹⁻⁶³⁾. However, PrEP adherence has also been shown to be aided by prior knowledge of potential side-effects and receiving advice from healthcare staff^(17, 20).

Some research findings show demographic factors, such as younger age^(36, 42, 64) and lower income^(52, 64, 65), as associated with increased PrEP acceptability. Others have demonstrated associations between sexual risk and increased PrEP acceptability, including higher number of partners^(39, 42, 45, 54), condomless anal intercourse^(11, 22, 36, 38, 39, 49, 50, 59), a history of sexually transmitted infections (STIs)^(52, 55), reported anal sex with a person with diagnosed HIV, or with a partner of unknown status^(39, 43, 59, 66-68) and self-reported barriers to condom use⁽⁵¹⁾.

Findings reporting on the association between self-perceived HIV risk and PrEP acceptability have showed varied results. Findings from a number of studies in high-income countries and preliminary data from the Brazilian demonstration project show a positive association between perceiving oneself to be at risk of HIV and PrEP acceptability or uptake^(36, 41-43, 50, 59, 69). Conversely, a Thai study found higher self-perceived risk was negatively associated with PrEP acceptability; this counterintuitive finding may have been partly affected by respondents' low levels of actual risk or unmeasured confounding factors⁽⁵³⁾. Studies in Asia have also found that fear and worry of contracting HIV was associated with PrEP acceptability^(52, 54). A limited number of studies have also shown an association between HIV testing history and PrEP acceptability, with having ever tested for HIV and having tested in the last year being associated with increased PrEP acceptability^(55, 59).

Considerations for PrEP Implementation in Myanmar

While results from randomised controlled trials and observational studies clearly demonstrate the efficacy of PrEP for HIV prevention, PrEP prevention effectiveness at a population-level will depend on a range of local factors that will influence the reach and accessibility of HIV prevention and care. The capacity, structure and service models of local health systems will be crucial to ensuring that opportunities to access and adhere to PrEP exist for those at highest risk, alongside access to other HIV prevention and care services (e.g., condom distribution, needle and syringe programmes, diagnostic testing, timely ARV treatment).

In Myanmar, many of the issues identified above are highly relevant. The Myanmar Government and the Ministry of Health must consider, for both internal funding allocation and as part of future international donor funding applications, the role of PrEP within a comprehensive HIV prevention strategy and in the context of ARV treatment coverage targets. Alongside local and international non-government organisations (NGOs) and other stakeholders working in HIV prevention and care in Myanmar, the Myanmar Government needs to assess the capacity of current HIV service structures to support an effective PrEP programme targeting key affected populations. PrEP implementation is likely to require health systems strengthening and identifying the role of existing services and programmes in potentially supporting PrEP implementation.

The recent decentralisation of Myanmar's health system to allow provision of HIV services through NGOs is likely to offer key advantages in delivering biomedical prevention programmes like PrEP through community-based health and prevention services. The leveraging of existing community-based HIV programmes offers potential PrEP implementation cost savings and can take advantage of the levels of

engagement and trust established with at-risk populations. Fear of stigma and discrimination may pose a significant barrier to the uptake of PrEP⁽⁷⁰⁾. In light of the criminalisation of HIV risk behaviours such as male-male sex and injecting drug use in Myanmar, and alongside the high levels of stigma and marginalisation experienced by key affected populations, health service programmes offered in community-based settings may help overcome these issues. Published PrEP guidelines also emphasise that to enhance overall HIV prevention effectiveness, PrEP must be offered as a component of a comprehensive package of HIV prevention strategies, including the provision of condoms and frequent STI testing^(1, 14, 25). The integration of PrEP within programmes already offering HIV prevention services in Myanmar will help optimise its HIV prevention impact.

As part of assessing local factors likely to be important in PrEP effectiveness, it is crucial to undertake research with relevant populations. The initial step in this research should involve gaining an understanding of the level of acceptability of PrEP as a HIV prevention tool among those at risk of HIV acquisition. Assessing factors associated with PrEP acceptability and exploring potential personal and structural barriers associated with accessing services needed for the effective and clinically safe provision of PrEP will afford important insights that inform potential PrEP programme implementation.

Section 2: Study aims

The overall aims of this study were to assess the level of acceptability of PrEP among MSM, the factors associated with willingness to take PrEP and explore considerations for potential PrEP implementation in Myanmar. Specific objectives include:

1. Determining the level of PrEP acceptability among a sample of MSM in Yangon and Mandalay;
2. Exploring the factors associated with the acceptability of PrEP among a sample of MSM in Yangon and Mandalay; and
3. Exploring potential barriers to the uptake and effectiveness of PrEP among MSM in Myanmar.

Section 3: Methods

Study design and participants

A quantitative, cross-sectional survey was administered to MSM recruited through Myanmar Burnet Institute (BI-MM) and the Myanmar Business Coalition on AIDS (MBCA) HIV prevention outreach programmes in Yangon and Mandalay. This programme, funded by Global Fund to Fight AIDs, Tuberculosis and Malaria (GFATM), provides HIV related education, referral to HIV testing and distributes condoms and lubricant through a network of local peer educators.

Between November and December 2014, trained peer educators and field researchers from MBCA and BI-MM identified potential participants through convenience and snowball sampling strategies in known MSM cruising sites and hotspots in Yangon and Mandalay. Once peer educators and field researchers identified potential participants they were provided with a brief explanation of the study and given a study card that listed data collection times and locations. Participants' eligibility was assessed using the following criteria: aged 18 years or over; self-reported MSM; able and willing to provide informed consent; presented with a study card and had not previously participated in the study.

Survey design, collection and data management

Researcher-administered surveys were conducted at mutually acceptable times and safe locations. No identifying information was collected to ensure confidentiality and written, signed, informed consent was obtained from all participants prior to survey administration. Survey responses were collected via electronic tablet that was uploaded and securely stored as a password-protected file on a Burnet Institute server. Ethics approval was obtained from Alfred Health in Melbourne, Australia and from the Department of Medical Research, Lower Myanmar.

The survey was developed by the Melbourne Burnet Institute research team in conjunction with BI-MM; this included questions on basic demographics, sexual risk behaviours and five domains related to PrEP acceptability and condom use:

- willingness to use PrEP
- concern about using PrEP
- likelihood of decreased condom use if using PrEP
- confidence in discussing condoms with partner
- personal experience using condoms

After assessing awareness of PrEP, BI-MM researchers provided an overview of PrEP to participants which included: description of PrEP, dosage requirements, benefits related to preventing HIV (without providing

percentages/figures), potential side-effects, and information on PrEP's approval by the WHO and US health authorities in the US. Following the explanation of PrEP, participants responded to questions on willingness to use PrEP, concern about using PrEP and likelihood of decreased condom use if using PrEP.

Data analysis

The statistical software package Stata (Version 13.1) was used to analyse the data. This was preceded by data cleaning during which time duplicate, missing and erroneous entries were identified and managed. Where appropriate, responses were recoded in order to collapse categories with few responses, or to improve consistency with current literature and applicability to the Myanmar context.

HIV status was self-reported, determined by the question: 'Based on your last HIV test, what is your HIV status?' Those who had reportedly never tested were recoded as 'don't know/never tested' even if they had responded 'negative' or 'positive'.

The measures used to assess PrEP acceptability and associated factors, the primary outcome of this study, were adapted from methods used elsewhere⁽⁴²⁾. Briefly, using a Likert scale (0 – 4) seven statements were used to assess participants' willingness to use PrEP (e.g., 'I would be willing to take PrEP to prevent getting HIV' and 'I would take a pill everyday to prevent HIV'). A mean-score was derived from these seven items and used to produce a dichotomous outcome of 'willing to use PrEP' (for participants with a mean-score ≥ 3) and 'unwilling to use/neutral about PrEP' (for participants with a mean-score < 3). A similar mean-score scale was used to measure personal experience using condoms and confidence discussing condoms with partners.

Descriptive statistics were used to describe participant characteristics and potential barriers to uptake and effectiveness of PrEP, with chi-square tests used to assess any differences between participants from Mandalay and Yangon. Univariable relationships between key variables and the outcomes were assessed and multivariable logistic regression was used to identify variables independently associated with PrEP acceptability.

Section 4: Results

Participant characteristics

520 men completed the survey; 293 (56%) in Mandalay and 227 (44%) in Yangon. Demographic characteristics of the sample are described in Table 1. Approximately half were aged less than 25 years and self-identified as *Thange* (gender normative MSM who do not normally disclose their sexual attraction to men). About two thirds had completed high school or tertiary education and reported living with family. Participants' monthly income ranged from 0 to 2,000,000 MMK (median 130,000 MMK) (Table 1).

The demographic characteristics of participants recruited in Mandalay and Yangon was broadly similar, with the exception that participants in Mandalay more commonly self-identified as *Thange* and less likely to have completed tertiary education (Table 1).

Table 1: Demographics by recruitment site¹

	Total (N=520) n (%)	Mandalay (n=293) n (%)	Yangon (n=227) n (%)
Age (years)			
Median	24	24	24
<25	270 (52)	153 (52)	117 (52)
25-29	116 (22)	57 (19)	59 (26)
30-39	83 (16)	47 (16)	36 (16)
40+	50 (10)	36 (12)	14 (6)
Sexual identity²			
Apone	141 (27)	61 (21)	80 (36)
Apwint	136 (27)	76 (26)	60 (27)
Thange	236 (46)	151 (52)	85 (28)
Highest level of education			
Primary school or below ³	44 (8)	29 (10)	15 (7)
Middle school	135 (26)	86 (30)	49 (22)
High school	184 (35)	106 (36)	78 (35)
Tertiary studies	156 (30)	72 (25)	84 (37)
Living situation			
Alone	32 (6)	14 (5)	18 (8)
Sex partner ⁴	73 (14)	38 (13)	35 (15)
Family ⁵	357 (69)	210 (72)	147 (65)
Non-related adults	57 (11)	30 (10)	27 (12)
Monthly income			
Median (in MMK)	130 000	128 500	150 000

¹ NB: Missing responses not shown (totals may not = 520); % may not total 100 due to rounding ² Apone: gender normative men who admit primary sexual attraction to other men; Apwint: often effeminate/transgender (incl A chauk/Apwint who play a spiritual role in Nat-based spirituality); Thange: gender normative men who do not disclose primary sexual attraction to other men ³ Primary school or below: includes illiterate and primary school categories ⁴ Sex partner: includes same sex or opposite sex ⁵ Family: includes siblings and other relatives, dependent children and parents

Sexual Risk Behaviours

Sexual risk characteristics of participants are described in Table 2. Most participants reported one or more regular male partner in the past three months, with approximately 40% of these men reporting never or only occasionally using condoms during anal sex. While few men reported a regular partner who was HIV positive, approximately two thirds reported not knowing their regular partners' HIV status. Approximately three quarters of the sample reported sex with casual partners in the past three months, with one quarter reporting five or more casual partners in that time. Of those reporting casual partners, about one quarter reported never or only occasionally using condoms during anal sex. Over one third of the sample (36%; n=185) reported both regular and casual male partners in the past three months; 35% in Mandalay and 37% in Yangon (data not shown). On the last occasion of sex, most participants reported not knowing sex was going to occur in advance or only knew a few hours in advance. Thirteen percent of participants self-reported being HIV positive. Based on self-reported time since last HIV test the sample generally appeared to have good access to testing, with two thirds reporting their last HIV test was in the previous six months. Nearly one in five participants reported they had never tested for HIV (Table 2).

Participants in Yangon more commonly reported having one regular male partner, with Mandalay participants more commonly reporting no regular partner, more than one regular partner and casual male partners. The proportion of participants reporting routine use of condoms during sex with regular partners was similar in Mandalay and Yangon, but participants in Mandalay more commonly reported routine condom use with casual partners. Sex with casual partners was reported as more spontaneous among participants in Mandalay, who were more likely to report not knowing in advance they were going to have sex when recalling their last occasion of sex with a casual partner compared to participants in Yangon. Self-reported HIV prevalence was similar across recruitment locations. Self-reported testing history was broadly similar with participants in Mandalay slightly less likely to report their last HIV testing being in the past six months and more commonly reporting never having had a HIV test (Table 2).

Table 2: Sexual risk behaviours

	Total (N=520) n (%)	Mandalay (n=293) n (%)	Yangon (n=227) n (%)
Number of REGULAR male partners in the past three months			
No regular partners	202 (39)	124 (42)	78 (34)
One regular partner	222 (43)	106 (36)	116 (51)
More than 1 regular partner	96 (19)	63 (22)	33 (15)
Condom use with REGULAR male partners in the past three months¹			
No anal sex w/ regular partners	25 (8)	10 (6)	15 (10)
Never/Occasionally (<50%)	119 (38)	70 (42)	49 (33)
Often/Always (>50%)	170 (54)	87 (52)	83 (56)
What is the HIV status of your regular male partner(s)?¹			
Negative	160 (31)	73 (25)	87 (40)
Positive/Suspect positive	31 (6)	15 (5)	16 (7)
Don't know	322 (63)	205 (70)	117 (53)
Number of CASUAL male partners in the past three months			
No casual partners	143 (28)	69 (25)	74 (33)
2-5 casual male partners	238 (47)	141 (50)	97 (43)
More than 5 casual male partners	125 (25)	72 (26)	53 (24)
Condom use with CASUAL male partners in the past three months²			
No anal sex w/ casual partners	3 (<1)	1 (<1)	2 (<1)
Never/Occasionally (<50%)	96 (26)	50 (23)	46 (31)
Often/Always (>50%)	270 (74)	169 (77)	101 (68)
At last occasion of anal sex with a casual male partner, how far in advance did you know you were going to have sex?²			
No anal sex w/ casual partners	3 (<1)	1 (<1)	2 (<1)
One day or more	64 (18)	17 (8)	47 (36)
Less than an hour/a few hours	155 (43)	102 (46)	53 (38)
Did not know in advance	138 (38)	100 (45)	38 (27)
Participant HIV status			
HIV positive	66 (13)	35 (12)	31 (14)
HIV undiagnosed (HIV -ve, don't know)	444 (88)	254 (88)	190 (86)
Last tested for HIV among HIV undiagnosed men³			
In the last 6 months	296 (67)	161 (63)	135 (72)
Over six months to two years ago	53 (12)	33 (13)	20 (11)
More than 2 years since last test	19 (4)	11 (4)	8 (4)
Never tested	73 (17)	49 (19)	24 (13)

¹ Among men reporting a regular male sex partner(s) ² Among men reporting a casual male sex partner(s) ³ Among reporting men reporting as HIV negative or unsure of HIV status

Personal Experience and Attitudes Towards Condoms

Table 3 reports classification of participants' self-reported experience with condoms and confidence negotiating condom use aggregated across a range of responses to questions reflecting their personal experiences using condoms (see Section 3: Methods). Based on scale scores, the majority of the sample reported negative personal experiences using condoms. However, most participants were confident discussing the use of condoms with sexual partners. Classification of personal experience using condoms

was similar across recruitment site, but participants recruited in Mandalay reported being more confident negotiating condom use with their partners (Table 3).

Table 3: Personal experiences using condoms and confidence negotiating condom use

	Total (N=520) n (%)	Mandalay (n=293) n (%)	Yangon (n=227) n (%)
Personal Experience Using Condoms¹			
Positive experience	98 (19)	48 (16)	50 (23)
Negative experience	407 (81)	244 (84)	163 (77)
Confidence Discussing Condom Use with Partners²			
Confident	360 (70)	223 (77)	137 (62)
Not confident/neutral	152 (30)	68 (23)	84 (38)

¹ Aggregate of eight items scored between 0 'strongly disagree' to 4 'strongly agree'; mean score ≥ 3 classified as 'positive experience'

² Aggregate of two items scored between 0 'strongly disagree' to 4 'strongly agree'; mean score ≥ 3 classified as 'confident'

PrEP Awareness and Acceptability Among HIV Undiagnosed MSM

The following results describe PrEP awareness and acceptability among HIV undiagnosed men.

Awareness of PrEP was low among participants. Only five percent of participants reported PrEP awareness (having heard of PrEP and be able to provide an accurate description of PrEP); three percent of participants recruited in Mandalay and eight percent in Yangon reported being aware of PrEP.

After providing an explanation of PrEP, including several clinical and prevention attributes of PrEP, participants were asked questions about their willingness to use PrEP using a seven-item previously validated Willingness to Use PrEP scale (see Section 3: Methods). Table 4 describes participants' responses on the Willingness to Use PrEP scale.

Table 4: Responses to each item on the Willingness to Use PrEP scale¹

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
I would be willing to take PrEP to prevent getting HIV	4 (1)	35 (8)	19 (4)	265 (61)	108 (25)
I would take pills before and after sex to prevent HIV	4 (1)	37 (9)	22 (5)	291 (68)	77 (18)
I would take a pill every day to prevent HIV	7 (2)	44 (10)	26 (6)	280 (65)	74 (17)
I am going to take PrEP as soon as it is available	7 (2)	40 (9)	30 (7)	256 (59)	98 (23)
I would never need to take PrEP (reverse scored)	82 (19)	278 (65)	28 (7)	33 (8)	10 (2)
I would be willing to pay for PrEP	51 (12)	143 (33)	79 (18)	140 (32)	18 (4)
I would take PrEP even if it wasn't 100% effective	12 (3)	68 (16)	24 (6)	287 (67)	40 (9)

¹Excludes 13 missing responses from MSM reporting HIV negative or unsure; n=431

Thirty-nine percent of HIV undiagnosed participants were classified as willing to use PrEP (score ≥ 3). The proportion of participants classified as willing to use PrEP was relatively consistent among MSM recruited in Yangon (37%) and Mandalay (40%). The cumulative proportion of participants responding 'agree' or 'strongly agree' (or 'disagree' or 'strongly disagree' for reverse coded item 5) was generally consistent (between 76% and 86%), with the exception of 'I would be willing to pay for PrEP' where the proportion decreased substantially to only 36% (Table 4).

Tables 5-7 describes unadjusted and adjusted correlates of willingness to use PrEP. Two adjusted models are presented: Model 1 - Number of partners; and Model 2 - Condom use. The separate models allowed for the examination of two important risk factors – number of regular and casual partners and condom use with regular and casual partners – which had a high degree of collinearity. Adjusted models control simultaneously for all factors presented in Tables 5-7.

Few variables were statistically significantly associated with willingness to use PrEP at either a univariable or multivariable level. Those reporting one regular partner compared to more than one regular partner (Model 1: AOR= 0.43, 95%CI: 0.22 – 0.82, p=0.01) and those reporting concern about the side-effects and long-term use of PrEP (Model 1: AOR= 0.40, 95%CI: 0.24 – 0.67, p<0.01; Model 2: AOR= 0.36, 95%CI: 0.22 – 0.61, p<0.01) were significantly less likely to be classified as willing to use PrEP. Those reporting never or

only occasionally using condoms with casual male partners (compared to always/often) were more likely to be classified as willing to use PrEP (Model 2: AOR=1.96, 95%CI: 1.02 – 3.76, p=0.04).

Although falling short of statistical significance (potentially as a result of a smaller number of responses and limited statistical power), there were a range of factors demonstrating a potentially meaningful association (AORs ≥ 1.5 or ≤ 0.5) with willingness to use PrEP that could inform the implementation of PrEP for MSM in Myanmar.

Reporting an HIV positive regular partner (Model 1: AOR=2.03, 95%CI 0.54 – 7.70, p=0.30; Model 2: AOR = 2.28, 95%CI: 0.61 – 8.48, p=0.22), living with unrelated adults (compared to living alone) (Model 1: AOR=1.77, 95%CI: 0.56 – 5.59, p=0.39; Model 2: AOR=2.24, 95%CI: 0.71 – 7.09, p=0.20), reporting a higher monthly income (median sample income or above; Model 1: AOR=1.53, 95%CI: 0.95 – 2.44, p=.08), reporting the last HIV test as being between in the past six and 24 months (compared to the past six months; Model 2: AOR=1.60, 95%CI: 0.79 – 3.25, p=0.19) and, counter-intuitively, reporting no casual partners (compared to five or more casual partners) in the past three months (Model 1: AOR= 1.89, 95%CI: 0.91 – 3.95, p=0.09) were associated with increased willingness to use PrEP.

Table 5: Univariable and multivariable relationship with PrEP acceptability - Demographics

			Univariable		Multivariable – Model 1 (No. partners)		Multivariable – Model 2 (Condom use)	
	Unwilling to use/neutral about PrEP (n=263) n(%)	Willing to use PrEP (n=168) n(%)	Odds Ratio	95% Confidence Interval	Adjusted Odds Ratio	95% Confidence Interval	Adjusted Odds Ratio	95% Confidence Interval
Place								
Yangon	112 (63)	67 (37)	1	--	1	--	1	--
Mandalay	151(60)	101 (40)	1.12	0.75 -1.66	1.23	0.75 -2.04	1.29	0.78 -2.13
Age, years (continuous, per year increase)			0.98	0.96 -1.01	0.98	0.95 -1.01	0.99	0.95 -1.02
Sexual identity								
Apone	69 (61)	44 (39)	1	--	1	--	1	--
Apwint	66 (64)	37 (36)	0.88	0.51 -1.53	0.86	0.44 -1.66	0.87	0.45 -1.67
Thange	124 (59)	86 (41)	1.09	0.68 -1.74	1.08	0.59 -1.95	1.15	0.64 -2.06
Living situation								
Alone	18 (67)	9 (33)	1	--	1	--	1	--
Sex partner	37 (66)	19 (34)	1.03	0.39 -2.72	0.93	0.29 -2.92	0.96	0.31 -2.98
Family	186 (62)	116 (38)	1.25	0.54 -2.87	0.94	0.36 -2.43	1.05	0.41 -2.70
Unrelated adults	22 (49)	23 (51)	2.09	0.78 -5.63	1.65	0.53 -5.15	2.12	0.68 -6.63
Monthly income								
< median income (0 - 130 000 MMK)	128 (63)	75 (37)	1	--	1	--	1	--
≥ median income (130 000 MMK & above)	131 (59)	92 (41)	1.20	0.81 -1.78	1.53	0.95 -2.44	1.45	0.91 -2.31



Table 6: Univariable and multivariable relationships with PrEP acceptability - Sexual Risk Behaviours

			Univariable		Multivariable – Model 1 (No. partners)		Multivariable – Model 2 (Condom use)	
	Unwilling to use/neutral about PrEP (n=263) n(%)	Willing to use PrEP (n=168) n(%)	Odds Ratio	95% Confidence Interval	Adjusted Odds Ratio	95% Confidence Interval	Adjusted Odds Ratio	95% Confidence Interval
Number of regular male partners in past three months								
> 1 regular male partner	42 (53)	37 (47)	1	--	1	--	--	--
1 regular male partner	118 (66)	61 (34)	0.58*	0.34 – 0.99	0.43*	0.22 – 0.82	--	--
No regular male partners	103 (59)	71 (41)	0.78	0.46 – 1.34	0.89	0.48 – 1.64	--	--
Condom use with regular male partners								
Often/Always (>50%)	83 (62)	51 (38)	1	--	--	--	1	--
Never/Occasionally (<50%)	64 (65)	35 (35)	0.89	0.52 – 1.53	--	--	0.92	0.46 – 1.85
No regular male partners	114 (58)	81 (42)	1.16	0.74 – 1.81	--	--	1.33	0.76 – 2.31
Number of casual male partners in the past three months								
5+ casual male partners	59 (66)	31 (34)	1	--	1	--	--	--
2 – 5 casual male partners	125 (61)	81 (39)	1.23	0.74 – 2.07	1.21	0.65 – 2.25	--	--
No casual male partners	72 (59)	51 (41)	1.35	0.78 – 2.37	1.89	0.91 – 3.95	--	--
Condom use with casual male partners								
Often/Always (>50%)	139 (64)	77 (36)	1	--	--	--	1	--
Never/Occasionally (<50%)	47 (57)	35 (43)	1.34	0.80 – 2.26	--	--	1.96*	1.02 – 3.76
No casual male partners	74 (59)	52 (41)	1.27	0.81 – 1.99	--	--	1.71	0.98 – 3.02
What is the HIV status of your regular male partner(s)?								
Negative	82 (57)	61 (43)	1	--	1	--	1	--
Positive/ Suspect positive	7 (41)	10 (59)	1.92	0.69 – 5.33	2.03	0.54 – 7.70	2.28	0.61 – 8.48
Don't know	170 (64)	97 (36)	0.78	0.51 – 1.16	0.79	0.46 – 1.35	0.84	0.49 – 1.43
Last tested for HIV								
In the last 6 months	175 (61)	113 (39)	1	--	1	--	1	--
6 months to 2 years	27 (53)	24 (47)	1.38	0.76 – 2.50	1.47	0.73 – 2.98	1.60	0.79 – 3.25
>2 years /never tested	59 (66)	32 (34)	0.78	0.48 – 1.30	0.75	0.41 – 1.37	0.79	0.43 – 1.43

Table 7: Univariable and multivariable relationships with PrEP acceptability - Attitudinal items

			Univariable		Multivariable – Model 1 (No. partners)		Multivariable – Model 2 (Condom use)	
	Unwilling to use/neutral about PrEP (n=263) n(%)	Willing to use PrEP (n=168) n(%)	Odds Ratio	95% Confidence Interval	Adjusted Odds Ratio	95% Confidence Interval	Adjusted Odds Ratio	95% Confidence Interval
Self-perceived risk of HIV								
Unlikely to become HIV+	135 (61)	85 (39)	1	--	1	--	1	--
Likely to become HIV+	110 (60)	74 (40)	1.07	0.72 – 1.59	1.08	0.67 – 1.75	1.09	0.67 – 1.76
Personal experience using condoms								
Negative/Neutral	213 (62)	131 (38)	1	--	1	--	1	--
Positive	40 (54)	34 (46)	1.38	0.83 – 2.29	1.19	0.66 – 2.14	1.16	0.64 – 2.11
Confidence in discussing condom use with partners								
Not confident / Neutral	82 (64)	46 (36)	1	--	1	--	1	--
Confident	180 (60)	119 (40)	1.18	0.77 – 1.81	1.07	0.64 – 1.80	1.17	0.68 – 1.99
If I was taking PrEP, I would be concerned that people will think I am HIV positive								
Disagree	130 (58)	94 (42)	1	--	1	--	1	--
Agree	131 (64)	74 (36)	0.78	0.53 – 1.15	1.10	0.67 – 1.82	1.11	0.67 – 1.82
Concern about using PrEP because of side-effects and long-term use								
Not concerned	133 (53)	116 (47)	1	--	1	--	1	--
Concerned	128 (72)	49 (28)	0.44**	0.29 – 0.66	0.40**	0.24 – 0.67	0.36**	0.21 – 0.61

Considerations for implementation of PrEP in Myanmar: potential barriers to the uptake and effectiveness

Guidelines for PrEP programmes underscore the requirement for regular HIV testing and clinical assessments (alongside recommendations for integrated primary prevention) to enhance the safety and prevention effectiveness of PrEP programmes. These guidelines would recommend the potential for PrEP implementation programmes to be integrated into existing HIV testing and prevention services. To explore potential PrEP implementation barriers associated with such programme integration, we explored a range of potential barriers and facilitators to HIV testing among HIV undiagnosed MSM who were classified as willing to use PrEP (Table 8).

Among MSM classified as willing to use PrEP, the most common general barriers to HIV testing related to the convenience of testing and attending services were: not having enough time (48%), barriers associated with the location of services (46%) and their opening hours (42%). Nearly one third of these participants reported the cost of HIV testing (30%) and the waiting time to get tested (29%) as a barrier to testing. Although less commonly reported than the main structural/convenience-related barriers to HIV testing, psycho-social barriers related to fear of HIV disclosure (34%) and stigma associated with attending a HIV testing services (25%) were also reported. In general, barriers related to the convenience of HIV testing were more commonly reported by MSM recruited in Mandalay, whereas cost and stigma of attending a HIV testing service were more commonly reported among MSM recruited in Yangon (Table 8).

More than half of MSM (56%) reported being uncomfortable with trained female health professionals conducting testing. Very few MSM reported being uncomfortable with trained male health professionals (9%) or trained peers (12%) providing HIV testing. Half of MSM reported being uncomfortable testing for HIV at government hospitals (50%) and almost two thirds reported being uncomfortable testing in private hospitals (62%). There was almost universal acceptability of testing for HIV at NGOs, with only two percent reporting being uncomfortable testing at these services (Table 8).

Table 8: Potential barriers to uptake among those classified as willing to use PrEP¹

	Total (N=168)	Mandalay (n=101)	Yangon (n=67)
Barriers to HIV diagnostic testing		Agree n (%)	
I'm worried about being seen attending a HIV testing service for fear of stigma	39 (25)	21 (21)	18 (31)
I'm afraid of letting other people know if my test shows I have HIV for fear of stigma	54 (34)	35 (35)	19 (32)
I can't afford the cost of getting tested	48 (30)	26 (26)	22 (37)
I haven't got enough time to get tested	77 (48)	51 (51)	26 (44)
The times that testing services are open make it hard for me to test	67 (42)	55 (55)	12 (20)
I have to wait a long time at a testing service to get a test	46 (29)	29 (29)	17 (29)
It's difficult to access testing services because of where they are located	73 (46)	49 (49)	24 (41)
Acceptability HIV testing by personnel		Uncomfortable n (%)	
Appropriately trained male nurse/doctor/counsellor	15 (9)	7 (7)	8 (13)
Appropriately trained female nurse/doctor/counsellor	90 (56)	53 (53)	37 (61)
Appropriately trained peer nurse/counsellor	19 (12)	15 (15)	4 (7)
Acceptability settings in which HIV testing is provided		Uncomfortable n (%)	
Government hospital	81 (50)	37 (37)	44 (72)
Private hospital	101 (62)	54 (53)	47 (77)
NGO/iNGO	3 (2)	3 (3)	0 (0)

¹ Excludes missing responses

Section 5: Discussion

This study of MSM recruited through the GFATM-funded Burnet Institute and Myanmar Business Coalition on AIDS (BI/MBCA) HIV prevention outreach programmes, found 39% of the HIV undiagnosed men were classified as willing to take PrEP. This level of acceptability is higher than those reported among Australian MSM (28.2% to 23.3%) using the same Willingness to Use PrEP scale^(41, 42) but is consistent with findings from studies of MSM in neighbouring Thailand that showing levels of acceptability ranging from 35% to 41%⁽⁵³⁻⁵⁵⁾. Study findings of MSM in China showed higher levels of PrEP acceptability ranging from 63% to 68%^(22, 51, 52).

While participants in this study had prior engagement with community-based HIV prevention services and thereby may not be representative of a diverse population of MSM in Myanmar, high PrEP acceptability among MSM engaged with services like the BI/MBCA programmes supports the potential effectiveness of PrEP implementation in Myanmar. International guidelines emphasise the need to implement PrEP as part of a comprehensive HIV prevention strategy that includes primary prevention and routine HIV/STI testing^(14, 25, 71). PrEP implementation through established HIV prevention programmes that offer primary prevention, HIV diagnostic testing and capacity to support the clinical needs of those being prescribed PrEP (e.g., clinical workforce, linkage to laboratory services) would be consistent with international guidelines. The model would additionally enhance cost effectiveness by leveraging from existing capacity. Community-based and peer-involved models are likely to offer considerable advantages. Our findings suggest a strong preference for HIV testing through NGO programmes rather than hospital services, a preference potentially related to perceptions or experiences of HIV-related and co-characteristic stigma and discrimination in clinical and healthcare environments^(34, 35). This fear of stigma has been identified as an issue in a number of PrEP studies e.g., ^(11, 17-23) and has been highlighted as a potentially significant barrier to the uptake of PrEP and therefore its individual and population-level effectiveness⁽⁷⁰⁾. The competencies of healthcare staff have also been identified as vital to the successful implementation of PrEP^(17, 20). Programmes to address potential stigma among PrEP users are recommended^(2, 24), alongside ensuring PrEP programmes are implemented through safe and trusted environments to facilitate their reach and PrEP adherence⁽⁷⁰⁾.

PrEP is intended for people who are at substantial risk of HIV exposure⁽⁷¹⁾. A meaningful proportion of MSM completing the survey reported an array of sexual risk behaviours that place them at risk of HIV acquisition and/or transmission to others, including reporting more than one regular sex partner, multiple casual sex partners, regular and concurrent casual sex partners, infrequent condom use with regular and casual sex partners, and regular sex partners who are HIV positive or of unknown status. In addition, one quarter of HIV negative participants perceived their risk of acquiring HIV as high. The only risk behaviours

significantly associated with willingness to use PrEP in this study were reporting never/only occasionally using condoms with casual partners and reporting more than one regular sex partner. In addition, while not statistically significant due to relative small participant numbers, MSM reporting an HIV positive regular partner were also much more likely to be classified as willing to use PrEP. While these men would be recommended to use PrEP if it were available and appear to recognise their risk and the potential benefits of PrEP, the majority of men reporting most of the risk behaviours described above were classified as not willing to use PrEP – the only exception was those who reported an HIV positive regular partner. While it is beyond the scope of this report to determine why these men would not find PrEP more acceptable, we also found that concern regarding side-effects was significantly associated with being classified as not willing to use or have a neutral attitude toward using PrEP. These data suggest that the potential future implementation of PrEP in Myanmar must also be accompanied by extensive community engagement and education – this is further supported by the very low levels of knowledge of PrEP among participants at the time of data collection. Such an education programme should reinforce knowledge regarding an individual’s HIV risk and knowledge regarding PrEP, including accurate information on the relative risk of side-effects and how the provision of PrEP is clinically managed (e.g., monitoring of side-effects and how they would be responded to).

Beyond generalised indicators of substantial HIV risk, PrEP is specifically intended for people who do not always use condoms (or other highly protective primary prevention behaviours such as using previously unused needles and syringes among people who inject drugs), including those who simply prefer sex without condoms, those who may lack the negotiating skills and/or level of empowerment to insist on condom use, and in instances when condoms are not available⁽⁷¹⁾. In this study, a large majority of participants were classified as having negative experiences associated with condoms (e.g., reduced pleasure, difficulty using condoms), but most reported being confident in negotiating condom use with partners. Neither factor was associated with willingness to use PrEP. Barriers to condom use among MSM, especially in jurisdictions where sex between men is criminalised and/or a highly marginalised behaviour, might arise from the locations where sex partners are met and the opportunistic nature of sex. In this study, when reflecting on their last occasion of anal sex, most men reported either not knowing in advance they were going to have sex or only knowing a few hours in advance. In such circumstances, PrEP may play a protective role for individuals who otherwise would use condoms but were not sufficiently prepared in advance. Qualitative findings from PrEP open label extension studies suggest that some MSM will consider PrEP as an additional protective strategy to be used with condoms rather than as a replacement for condoms⁽⁷²⁾. Consistent with global recommendations, these data suggest that any future implementation of PrEP targeting MSM in Myanmar should occur as part of a comprehensive HIV prevention programme that includes prevention education and condom reinforcement and distribution.

Reported HIV diagnostic testing frequency in this sample was high, with two thirds of the sample reporting their last HIV test was in the previous six months – while at the time of the survey the BI/MBCA programme was not offering HIV testing (with referral information provided during contact with clients) the programme commenced fixed site point-of-care HIV testing in March 2015. Again, such high levels of engagement with HIV testing services suggest MSM engaged with the BI/MBCA programme would be a suitable target population for the providing PrEP under international recommended guidelines. Our study found that those who reported their last HIV test as between six and 24 months ago were more likely to be classified as willing to use PrEP compared to those who last tested in the past six months. There are limited studies that have shown an association between a history of testing or recent testing for HIV and PrEP acceptability^(49, 55, 59). While it is unclear what is driving this result the question did only ask for participants' most recent HIV test, which does not necessarily reflect their typical testing frequency. In addition, those who have tested for HIV frequently may also be better engaged with HIV prevention services, be more likely implement prevention strategies including frequent testing and negotiating condom use and may therefore not feel they need PrEP as an additional prevention tool.

Other factors showing some (albeit non-significant) association with willingness to use PrEP included higher income, living with unrelated adults, and not reporting recent casual sex partners. Willingness to pay for PrEP was the factor least favoured by participants in the willingness to use PrEP scale and is likely to have influenced the relationship between PrEP acceptability measured through this scale and income. These data do however suggest that a PrEP programme in Myanmar will need to be strongly supported by Government of Myanmar or international donor funds, as any cost placed on the user is likely to impact substantially on the reach and population-level effectiveness of the a PrEP programme. In our study sample, those living with unrelated adults (compared with all other categories) were more likely to find PrEP acceptable. This perhaps points to the concerns about revealing their sexual identity or high-risk behaviours to others such as sex partners or family if taking PrEP. Prescribing daily PrEP may alleviate such fears, with findings from a Thai qualitative study suggesting many MSM preferred daily PrEP as it can easily be taken innocuously with daily vitamins or as an assumed dietary supplement⁽⁷³⁾. Prescription of daily PrEP is also recommended by the WHO for MSM and would also be consistent with our findings regarding the opportunistic occurrence of sex that would recommend against any consideration of event-based PrEP. The finding that reporting no recent casual sex partners as being associated with willingness to use PrEP among study participants is inconsistent with previous findings that demonstrated that those with a higher number of partners report higher PrEP acceptability^(39, 42, 45, 54). It is unclear what is driving this unexpected relationship, but this finding may relate to complexities and fluidities of sexual relationships for MSM⁽⁷⁴⁾, including agreements with regular partner about sex outside of relationships

and perceptions of reciprocity in these agreements^(74, 75) and changes in the type and number of sexual relationships over time (recall periods for sexual risk questions referred to the past three months).

Questions asked of study participants around barriers to HIV testing and the acceptability of HIV testing service models may provide insights into the possible individual, structural and social barriers to PrEP implementation given the clinical and logistical need to provide PrEP through fixed site services that also offer HIV testing and other aspects of clinical care. While logistical issues related to time and location of testing services appeared prominent, the extent to which these are real operational barriers to PrEP implementation need to be considered against the fact that two thirds of the sample reported a previous HIV test in the past six months. The prevention benefits of PrEP may therefore out way convenience-related barriers. However, considering the crucial role of retention and adherence in enhancing PrEP population-level effectiveness, making services convenient to clients will be important. Concerns related to perceived stigma of accessing HIV-related services were generally low but was still nominated by one in four participants. Responses strongly favouring NGO delivered HIV testing services and low levels of concerns regarding the involvement of peers in HIV testing strongly recommend the use of decentralised and community-based NGO-delivered HIV services for the provision of PrEP to MSM in Myanmar (see also the earlier discussion points regarding community trust and perceptions of stigma experienced through mainstream health services).

Section 6: Conclusion

Among the first steps in local-level considerations of the role of PrEP in HIV prevention is the determination of acceptability of PrEP among key risk populations and the identification of potential operational or psycho-social barriers to PrEP prevention effectiveness. This study provides preliminary information on these issues as they relate to MSM in Myanmar.

This study was not designed to provide recommendations regarding whether PrEP should be adopted as part of a suite of HIV prevention initiatives in Myanmar nor provide explicit recommendations regarding what a PrEP implementation model should look like. Nevertheless, the study does provide some insights to inform a range of potential considerations related to PrEP implementation targeting MSM in Myanmar.

The key outcome of the study is that, despite very low levels of pre-existing knowledge, following a brief explanations of the attributes of PrEP, using PrEP as an HIV prevention strategy was acceptable to a meaningful proportion of MSM engaged with existing HIV prevention services in Yangon and Mandalay. Based on international evidence and findings from this study, particular HIV service structures that have emerged in Myanmar over recent years may also provide ideal mechanisms through which to implement PrEP. The Myanmar National Strategic Plan II on HIV/AIDS highlights the need to improve the accessibility and quality of HIV prevention and treatment strategies for MSM given the heightened prevalence in this population. The significant investment that has been made over recent years in the implementation and maintenance of accessible HIV services to MSM in Myanmar may also offer an important foundation for future PrEP programmes.

It remains unclear, however, what the underlying motivations and barriers are that drive the relative willingness of MSM in Myanmar to consider using PrEP. Undertaking well-designed qualitative research with MSM in Myanmar in the future may yield useful information to better understand these issues and how they might help inform PrEP implementation. Despite strong evidence from randomised and observational trials from around the world that show high levels of HIV prevention efficacy and effectiveness from PrEP, it also remains unclear how effective PrEP would be in preventing new HIV infections among MSM and other high risk population in Myanmar. To inform any future PrEP implementation programmes in Myanmar, it will be important to undertake PrEP implementation/demonstration projects to examine its prevention effectiveness and explore related outcomes such as drug adherence and logistical issues associated with PrEP dispensing and monitoring. Such projects will be vitally important to better understand the potential cost effectiveness of PrEP in relation to averting future HIV burden of disease and in the allocation of current HIV-related resources to improving the coverage of ARV therapy to people living with HIV in Myanmar.

References

1. WHO. Consolidated Guidelines on HIV Prevention, Diagnosis, Treatment and Care for Key Populations. 2014.
2. WHO. WHO Technical Update on Pre-Exposure Prophylaxis (PrEP). 2015.
3. Grant RM, Lama JR, Anderson PL, McMahan V, Liu AY, Vargas L, et al. Preexposure Chemoprophylaxis for HIV Prevention in Men Who Have Sex with Men. *New England Journal of Medicine*. 2010;363(27):2587-99. PubMed PMID: 21091279.
4. Baeten JM, Donnell D, Ndase P, Mugo NR, Campbell JD, Wangisi J, et al. Antiretroviral Prophylaxis for HIV-1 Prevention among Heterosexual Men and Women. *The New England journal of medicine*. 2012 07/11;367(5):399-410. PubMed PMID: PMC3770474.
5. Thigpen MC, Kebaabetswe PM, Paxton LA, Smith DK, Rose CE, Segolodi TM, et al. Antiretroviral preexposure prophylaxis for heterosexual HIV transmission in Botswana. *New England Journal of Medicine*. 2012;367(5):423-34.
6. Molina JM, Capitant C, Charreau I, Meyer L, Spire B, Pialoux G, et al., editors. On Demand PrEP With Oral TDF-FTC in MSM: Results of the ANRS Ipergay Trial. Conference on Retroviruses and Opportunistic Infections (CROI); 2015; Seattle, USA.
7. Molina JMC, C; Spire, B; Pialoux, G; Chidiac, C; Charreau, I; Tremblay, C; Meyer, L; Delfraissy, J.F, editor On Demand PrEP with Oral TDF-FTC in MSM: Results of the ANRS Ipergay Trial Conference on Retroviruses and Opportunistic Infections (CROI); 2015; Seattle, USA.
8. McCormack S, Dunn DT, Desai M, Dolling DI, Gafos M, Gilson R, et al. Pre-exposure prophylaxis to prevent the acquisition of HIV-1 infection (PROUD): effectiveness results from the pilot phase of a pragmatic open-label randomised trial. *The Lancet*.
9. Choopanya K, Martin M, Suntharasamai P, Sangkum U, Mock PA, Leethochawalit M, et al. Antiretroviral prophylaxis for HIV infection in injecting drug users in Bangkok, Thailand (the Bangkok Tenofovir Study): a randomised, double-blind, placebo-controlled phase 3 trial. *The Lancet*. 2013;381(9883):2083-90.
10. Hosek S, Rudy B, Landovitz RJ, Kapogiannis B, Siberry G, Rutledge B, et al., editors. An HIV pre-exposure prophylaxis (PrEP) demonstration project and safety study for young men who have sex with men in the United States (ATN 110). Eighth International AIDS Society Conference on HIV Pathogenesis, Treatment and Prevention; 2015; Vancouver, Canada.
11. Grant RM, Anderson PL, McMahan V, Liu AY, Amico KR, Mehrotra M, et al. Uptake of pre-exposure prophylaxis, sexual practices, and HIV incidence in men and transgender women who have sex with men: a cohort study. *The Lancet Infectious Diseases*. 2014;14(9):820-9.
12. McCormack S, Dunn DT, Desai M, Dolling DI, Gafos M, Gilson R, et al. Pre-exposure prophylaxis to prevent the acquisition of HIV-1 infection (PROUD): effectiveness results from the pilot phase of a pragmatic open-label randomised trial. *The Lancet*. 2015.
13. Volk JE, Marcus JL, Phengrasamy T, Blechinger D, Nguyen DP, Follansbee S, et al. No New HIV Infections with Increasing Use of HIV Preexposure Prophylaxis in a Clinical Practice Setting. *Clinical Infectious Diseases*. 2015.

14. WHO. Guideline on when to start antiretroviral therapy and on pre-exposure prophylaxis for HIV. 2015.
15. FDA. Truvada for PrEP Fact Sheet: Ensuring Safe and Proper Use 2012. Available from: <http://www.fda.gov/downloads/NewsEvents/Newsroom/FactSheets/UCM312279.pdf>.
16. WHO. WHO/UNAIDS consultation on the ethics of PrEP and early initiation of ART for prevention. How should countries reach a decision? 2012.
17. Gilmore HJ, Liu A, Koester KA, Amico KR, McMahan V, Goicochea P, et al. Participant experiences and facilitators and barriers to pill use among men who have sex with men in the iPrEx pre-exposure prophylaxis trial in San Francisco. *AIDS patient care and STDs*. 2013 Oct;27(10):560-6. PubMed PMID: 24093809. Pubmed Central PMCID: Pmc3791030. Epub 2013/10/08. eng.
18. Golub SA, Gamarel KE, Rendina HJ, Surace A, Lelutiu-Weinberger CL. From efficacy to effectiveness: facilitators and barriers to PrEP acceptability and motivations for adherence among MSM and transgender women in New York City. *AIDS patient care and STDs*. 2013 Apr;27(4):248-54. PubMed PMID: 23565928. Pubmed Central PMCID: Pmc3624632. Epub 2013/04/10. eng.
19. Mimiaga MJ, Closson EF, Kothary V, Mitty JA. Sexual Partnerships and Considerations for HIV Antiretroviral Pre-Exposure Prophylaxis Utilization Among High-Risk Substance Using Men Who Have Sex with Men. *Arch Sex Behav*. 2014 2014/01/01;43(1):99-106. English.
20. Tangmunkongvorakul A, Chariyalertsak S, Rivet Amico K, Saokhieo P, Wannalak V, Sangangamsakun T, et al. Facilitators and barriers to medication adherence in an HIV prevention study among men who have sex with men in the iPrEx study in Chiang Mai, Thailand. *AIDS Care: Psychological and Socio-medical Aspects of AIDS/HIV*. 2013;25(8):961-7.
21. Van der Elst EM, Mbogua J, Operario D, Mutua G, Kuo C, Mugo PM, et al. High Acceptability of HIV Pre-exposure Prophylaxis but Challenges in Adherence and Use: Qualitative Insights from a Phase I Trial of Intermittent and Daily PrEP in At-Risk Populations in Kenya. *AIDS and Behavior*. 2013 2013/07/01;17(6):2162-72. English.
22. Zhou F, Gao L, Li S, Li D, Zhang L, Fan W, et al. Willingness to accept HIV pre-exposure prophylaxis among Chinese men who have sex with men. *PLoS One*. 2012;7(3):e32329. PubMed PMID: 22479320. Pubmed Central PMCID: 3316531.
23. Lippman SA, Koester KA, Amico KR, Lama JR, Martinez Fernandes N, Gonzales P, et al. Client and provider perspectives on new HIV prevention tools for MSM in the Americas. *PLoS One*. 2015;10(3):e0121044. PubMed PMID: 25826246. Pubmed Central PMCID: PMC4380356. Epub 2015/04/01. eng.
24. Kelley CF, Kahle E, Siegler A, Sanchez T, del Rio C, Sullivan PS, et al. Applying a PrEP Continuum of Care for Men Who Have Sex With Men in Atlanta, Georgia. *Clinical Infectious Diseases*. 2015 August 13, 2015.
25. CDC, US Public Health Service. Preexposure prophylaxis for the prevention of HIV infection in the United States - 2014: A clinical practice guideline. 2014.
26. Liu AY, Vittinghoff E, Sellmeyer DE, Irvin R, Mulligan K, Mayer K, et al. Bone mineral density in HIV-negative men participating in a tenofovir pre-exposure prophylaxis randomized clinical trial in San

Francisco. PLoS One. 2011;6(8):e23688. PubMed PMID: 21897852. Pubmed Central PMCID: PMC3163584. Epub 2011/09/08. eng.

27. Mulligan K, Glidden DV, Anderson PL, Liu A, McMahan V, Gonzales P, et al. Effects of Emtricitabine/Tenofovir on Bone Mineral Density in HIV-Negative Persons in a Randomized, Double-Blind, Placebo-Controlled Trial. *Clin Infect Dis*. 2015 Aug 15;61(4):572-80. PubMed PMID: 25908682. Epub 2015/04/25. eng.

28. Mugwanya KK, Wyatt C, Celum C, Donnell D, Mugo NR, Tappero JW, et al. Changes in glomerular kidney function among HIV-1-uninfected men and women receiving emtricitabine-tenofovir disoproxil fumarate preexposure prophylaxis: a randomized clinical trial. *JAMA internal medicine*. 2015;175(2):246-54.

29. Solomon MM, Lama JR, Glidden DV, Mulligan K, McMahan V, Liu AY, et al. Changes in renal function associated with oral emtricitabine/tenofovir disoproxil fumarate use for HIV pre-exposure prophylaxis. *AIDS*. 2014 Mar 27;28(6):851-9. PubMed PMID: 24499951. Pubmed Central PMCID: PMC3966916. Epub 2014/02/07. eng.

30. Abbas UL, Hood G, Wetzel AW, Mellors JW. Factors Influencing the Emergence and Spread of HIV Drug Resistance Arising from Rollout of Antiretroviral Pre-Exposure Prophylaxis (PrEP). *PLoS ONE*. 2011;6(4):e18165.

31. Sugarman J, Mayer KH. Ethics and pre-exposure prophylaxis for HIV infection. *Journal of acquired immune deficiency syndromes (1999)*. 2013 Jul;63 Suppl 2:S135-9. PubMed PMID: 23764625. Pubmed Central PMCID: Pmc3728665. Epub 2013/06/21. eng.

32. Grant RM, Liegler T. Weighing the risk of drug resistance with the benefits of HIV preexposure prophylaxis. *Journal of Infectious Diseases*. 2015;211(8):1202-4. PubMed PMID: 25587019.

33. Liegler T, Abdel-Mohsen M, Bentley LG, Atchison R, Schmidt T, Javier J, et al. HIV-1 drug resistance in the iPrEx preexposure prophylaxis trial. *The Journal of infectious diseases*. 2014;210(8):1217-27.

34. Chan KY, Stoové MA, Sringernyung L, Reidpath DD. Stigmatization of AIDS Patients: Disentangling Thai Nursing Students' Attitudes Towards HIV/AIDS, Drug Use, and Commercial Sex. *AIDS Behav*. 2008;12:146-57.

35. Chan KY, Yang Y, Li Z, Stoové MA, Reidpath DD. Interrelationships Between HIV/AIDS and Risk Behavior Prejudice Among Medical Students in Southern China. *Current HIV Research*. 2009;7 606-11.

36. Aghaizu A, Mercey D, Copas A, Johnson AM, Hart G, Nardone A. Who would use PrEP? Factors associated with intention to use among MSM in London: a community survey. *Sex Transm Infect*. 2013 May;89(3):207-11. PubMed PMID: 23015689.

37. Thng C, Thorpe S, Shembri G, editors. Acceptability of HIV pre-exposure prophylaxis (PrEP) and associated risk compensation in men who have sex with men (MSM) accessing GU services. 18th Annual Conference of the British HIV Association; 2012; Birmingham, UK.

38. Young I, Li J, McDaid L. Awareness and Willingness to Use HIV Pre-Exposure Prophylaxis amongst Gay and Bisexual Men in Scotland: Implications for Biomedical HIV Prevention. *PLoS ONE*. 2013;8(5):e64038.

39. Bil JP, Davidovich U, van der Veldt WM, Prins M, de Vries HJ, Sonder GJ, et al. What do Dutch MSM think of preexposure prophylaxis to prevent HIV-infection? A cross-sectional study. *AIDS*. 2015 May 15;29(8):955-64. PubMed PMID: 25915169. Epub 2015/04/29. eng.
40. Rocha LM, Campos MJ, Brito J, Fuertes R, Rojas J, Pinto N, et al. Acceptability of PrEP among HIV negative Portuguese men who have sex with men that attended 2014 Lisbon pride fair. *Journal of the International AIDS Society*. 2014;17(4 Suppl 3):19734. PubMed PMID: 25397480. Pubmed Central PMCID: Pmc4225295. Epub 2014/11/15. eng.
41. Holt M, Lea T, Murphy D, Ellard J, Rosengarten M, Kippax S, et al. Willingness to use HIV pre-exposure prophylaxis has declined among Australian gay and bisexual men: results from repeated national surveys, 2011-2013. *Journal of acquired immune deficiency syndromes (1999)*. 2014 Oct 1;67(2):222-6. PubMed PMID: 25078535. Epub 2014/08/01. eng.
42. Holt M, Murphy DA, Callander D, Ellard J, Rosengarten M, Kippax SC, et al. Willingness to use HIV pre-exposure prophylaxis and the likelihood of decreased condom use are both associated with unprotected anal intercourse and the perceived likelihood of becoming HIV positive among Australian gay and bisexual men. *Sex Transm Infect*. 2012 Jun;88(4):258-63. PubMed PMID: 22290327.
43. Kesler MA, Kaul R, Liu J, Loutfy M, Tharao W, Rebbapragada A, et al., editors. Willingness of HIV-uninfected MSM in Toronto, Canada to use pre-exposure prophylaxis. *Canadian Journal of Infectious Diseases and Medical Microbiology Conference: 23rd Annual Canadian Conference on HIV/AIDS Research; 2014; St. John's, NL Canada*.
44. Lebouche B, Sissoko D, Lessard D, Pant Pai N, Machouf N, Trottier B, et al., editors. Increased awareness of PrEP and PEP and higher immediate uptake of PEP among migrant men who have sex with men in l'Actuel sur Rue checkpoint. *Canadian Journal of Infectious Diseases and Medical Microbiology Conference: 23rd Annual Canadian Conference on HIV/AIDS Research; 2014; St. John's, NL Canada*.
45. Leonardi M, Lee E, Tan DH. Awareness of, usage of and willingness to use HIV pre-exposure prophylaxis among men in downtown Toronto, Canada. *International journal of STD & AIDS*. 2011 Dec;22(12):738-41. PubMed PMID: 22174057. Epub 2011/12/17. eng.
46. Dolezal C, Frasca T, Giguere R, Ibitoye M, Cranston RD, Febo I, et al. Awareness of Post-Exposure Prophylaxis (PEP) and Pre-Exposure Prophylaxis (PrEP) Is Low but Interest Is High Among Men Engaging in Condomless Anal Sex With Men in Boston, Pittsburgh, and San Juan. *AIDS Education and Prevention*. 2015 2015/08/01;27(4):289-97.
47. Eaton LA, Driffin DD, Bauermeister J, Smith H, Conway-Washington C. Minimal Awareness and Stalled Uptake of Pre-Exposure Prophylaxis (PrEP) Among at Risk, HIV-Negative, Black Men Who Have Sex with Men. *AIDS patient care and STDs*. 2015 Aug;29(8):423-9. PubMed PMID: 26083143. Epub 2015/06/18. eng.
48. Galindo GR, Walker JJ, Hazelton P, Lane T, Steward WT, Morin SF, et al. Community member perspectives from transgender women and men who have sex with men on pre-exposure prophylaxis as an HIV prevention strategy: implications for implementation. *Implementation science : IS*. 2012;7:116. PubMed PMID: 23181780. Pubmed Central PMCID: Pmc3527231. Epub 2012/11/28. eng.
49. Grov C, Whitfield TH, Rendina HJ, Ventuneac A, Parsons JT. Willingness to Take PrEP and Potential for Risk Compensation Among Highly Sexually Active Gay and Bisexual Men. *AIDS Behav*. 2015 Mar 4. PubMed PMID: 25735243. Epub 2015/03/05. Eng.

50. Krakower D, Mimiaga M, Rosengerger J, Novak D, Mitty J, White J, et al. Limited Awareness and Low Immediate Uptake of Pre-Exposure Prophylaxis among Men Who Have Sex with Men Using an Internet Social Networking Site. *PLoS One*. 2012;7(3).
51. Jackson T, Huang A, Chen H, Gao X, Zhong X, Zhang Y. Cognitive, psychosocial, and sociodemographic predictors of willingness to use HIV pre-exposure prophylaxis among Chinese men who have sex with men. *AIDS Behav*. 2012 Oct;16(7):1853-61. PubMed PMID: 22538373.
52. Zhang Y, Peng B, She Y, Liang H, Peng H-B, Qian H-Z, et al. Attitudes Toward HIV Pre-Exposure Prophylaxis Among Men Who Have Sex with Men in Western China. *AIDS Patient Care and STDs*. 2013;27(3):137-41. PubMed PMID: PMC3595955.
53. Sineath RC, Finneran C, Sullivan P, Sanchez T, Smith DK, Griensven F, et al. Knowledge of and interest in using preexposure prophylaxis for HIV prevention among men who have sex with men in Thailand. *Journal of the International Association of Providers of AIDS Care*. 2013 Jul-Aug;12(4):227-31. PubMed PMID: 23708677.
54. Wheelock A, Eisingerich AB, Ananworanich J, Gomez GB, Hallett TB, Dybul MR, et al. Are Thai MSM willing to take PrEP for HIV prevention? An analysis of attitudes, preferences and acceptance. *PLoS One*. 2013;8(1):e54288. PubMed PMID: 23342121. Pubmed Central PMCID: 3544831.
55. Yang D, Chariyalertsak C, Wongthanee A, Kawichai S, Yotruan K, Saokhieo P, et al. Acceptability of pre-exposure prophylaxis among men who have sex with men and transgender women in Northern Thailand. *PLoS One*. 2013;8(10):e76650. PubMed PMID: 24116132. Pubmed Central PMCID: 3792988.
56. Eisingerich AB, Wheelock A, Gomez GB, Garnett GP, Dybul MR, Piot PK. Attitudes and acceptance of oral and parenteral HIV preexposure prophylaxis among potential user groups: a multinational study. *PLoS One*. 2012;7(1):e28238. PubMed PMID: 22247757. Pubmed Central PMCID: 3256136.
57. Galea JT, Kinsler JJ, Salazar X, Lee SJ, Giron M, Sayles JN, et al. Acceptability of pre-exposure prophylaxis as an HIV prevention strategy: barriers and facilitators to pre-exposure prophylaxis uptake among at-risk Peruvian populations. *International journal of STD & AIDS*. 2011 May;22(5):256-62. PubMed PMID: 21571973. Pubmed Central PMCID: 3096991.
58. Peinado J, Lama JR, Galea JT, Segura P, Casapia M, Ortiz A, et al. Acceptability of oral versus rectal HIV preexposure prophylaxis among men who have sex with men and transgender women in Peru. *Journal of the International Association of Providers of AIDS Care*. 2013 Jul-Aug;12(4):278-83. PubMed PMID: 23422742. Epub 2013/02/21. eng.
59. Hoagland B, Veloso VG, De Boni RB, Madruga JV, Kallas EG, Fernandes NM, et al., editors. Pre-exposure prophylaxis (PrEP) uptake and associated factors among MSM and TGW in the PrEP Brasil demonstration project. Eighth IAS Conference on HIV Pathogenesis, Treatment and Prevention (IAS 2015); 2015; Vancouver, Canada.
60. Veloso VG, Mesquita F, Grinsztejn B. Pre-exposure prophylaxis for men and transgender women who have sex with men in Brazil: opportunities and challenges. *Journal of the International AIDS Society*. 2015;18(Suppl 3).
61. Kebaabetswe PM, Stirratt MJ, McLellan-Lemal E, Henderson FL, Gray SC, Rose CE, et al. Factors Associated with Adherence and Concordance Between Measurement Strategies in an HIV Daily Oral Tenofovir/Emtricitibine as Pre-exposure Prophylaxis (Prep) Clinical Trial, Botswana, 2007–2010. *AIDS and Behavior*. 2015 2015/05/01;19(5):758-69. English.

62. Liu AY, Vittinghoff E, Anderson PL, Doblecki-Lewis S, Bacon O, Chege W, et al., editors. Adherence, sexual behavior and HIV/STI incidence among men who have sex with men (MSM) and transgender women (TGW) in the US PrEP demonstration (Demo) project. Eighth International AIDS Society Conference on HIV Pathogenesis, Treatment and Prevention; 2015; Vancouver, Canada.
63. Psaros C, Haberer J, Thomas K, Katabira E, Ronald A, Tumwesigye E, et al., editors. Evaluation and process outcomes from an adherence intervention to support HIV pre-exposure prophylaxis (PREP) adherence in HIV-serodiscordant couples in Uganda. Journal of the International Association of Physicians in AIDS Care Conference: 7th International Conference on HIV Treatment and Prevention Adherence; 2012; Miami, FL United States.
64. Barash EA, Golden M. Awareness and use of HIV pre-exposure prophylaxis among attendees of a Seattle gay pride event and sexually transmitted disease clinic. AIDS patient care and STDs. 2010 Nov;24(11):689-91. PubMed PMID: 20863247. Epub 2010/09/25. eng.
65. Mimiaga MJ, Case P, Johnson CV, Safren SA, Mayer KH. Pre-Exposure Antiretroviral Prophylaxis (PrEP) attitudes in high risk Boston area MSM: Limited knowledge and experience, but potential for increased utilization after education. Journal of acquired immune deficiency syndromes (1999). 2009;50(1):77-83. PubMed PMID: PMC2659469.
66. Smith K. PrEP as a protective behaviour for MSM. STD Prevention Conference GA United States 2014. p. S45-S6
67. Cohen SE, Vittinghoff E, Bacon O, Doblecki-Lewis S, Postle BS, Feaster DJ, et al. High interest in preexposure prophylaxis among men who have sex with men at risk for HIV infection: baseline data from the US PrEP demonstration project. Journal of acquired immune deficiency syndromes (1999). 2015 Apr 1;68(4):439-48. PubMed PMID: 25501614. Pubmed Central PMCID: Pmc4334721. Epub 2014/12/17. eng.
68. Hoff CC, Chakravarty D, Bircher AE, Campbell CK, Grisham K, Neilands TB, et al. Attitudes Towards PrEP and Anticipated Condom Use Among Concordant HIV-Negative and HIV-Discordant Male Couples. AIDS patient care and STDs. 2015 Jul;29(7):408-17. PubMed PMID: 26057304. Pubmed Central PMCID: PMC4504342. Epub 2015/06/10. eng.
69. Gamarel KE, Golub SA. Intimacy Motivations and Pre-exposure Prophylaxis (PrEP) Adoption Intentions Among HIV-Negative Men Who Have Sex with Men (MSM) in Romantic Relationships. Annals of behavioral medicine : a publication of the Society of Behavioral Medicine. 2015 Apr;49(2):177-86. PubMed PMID: 25124457. Pubmed Central PMCID: Pmc4329279. Epub 2014/08/16. eng.
70. UNAIDS. AIDSinfo 2015. Available from: <http://aidsinfo.unaids.org/#>.
71. UNAIDS, editor Oral Pre-Exposure Prophylaxis-putting a new choice in context 2015.
72. Koester KA, R; Liu, A; McMahan, V; Hosek, K; Mayer, K; Grant, R editor Sex on PrEP: Qualitative findings from the iPrEx open label extension (OLE) in the US. AIDS 2014; 2014; Melbourne, Australia
73. Chemnasiri T, Varangrat A, Amico KR, Chaikummao S, Chitwarakorn A, Dye BJ, et al., editors. Patterns of sex and PrEP in Bangkok MSM (HPTN 067/ADAPT Study). Eighth International AIDS Society Conference on HIV Pathogenesis, Treatment and Prevention; 2015; Vancouver, Canada.
74. Hoff CC, Chakravarty D, Beougher SC, Neilands TB, Darbes LA. Relationship characteristics associated with sexual risk behavior among MSM in committed relationships. AIDS patient care and STDs.

2012 Dec;26(12):738-45. PubMed PMID: 23199191. Pubmed Central PMCID: PMC3513980. Epub 2012/12/04. eng.

75. Golub SA. Tensions between the epidemiology and psychology of HIV risk: implications for pre-exposure prophylaxis. *AIDS Behav.* 2014 Sep;18(9):1686-93. PubMed PMID: 24719201. Pubmed Central PMCID: PMC4127100. Epub 2014/04/11. eng.