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ORIGINAL PAPER

Risk Behavior Not Associated with Self-Perception of PrEP Candidacy: Implications for Designing PrEP Services

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Abstract

In a study of sexually-active HIV-negative men who have sex with men (MSM) in China, we compared behavioral indication for pre-exposure prophylaxis (PrEP) based on risk criteria to self-perception of PrEP candidacy (SPC) and explored factors associated with SPC. Of 708 MSM surveyed, 323 (45.6%) were behaviorally-indicated for PrEP, among whom 42.1% self-perceived as appropriate PrEP candidates. In a multivariable model we found no association between sexual behavior nor HIV risk perception and SPC but found that higher perceived benefits of PrEP, increased frequency of HIV testing, and low condom use self-efficacy were positively-associated with SPC. In a sub-analysis restricted to MSM behaviorally-indicated for PrEP, relationship-factors were also significant. Our findings suggest that PrEP implementers should look beyond risk criteria to consider shared decision-making tools that support individuals to assess whether they are appropriate PrEP candidates based on their existing HIV prevention strategies, sexual health goals, and relationship dynamics.

Keywords Pre-exposure prophylaxis · PrEP candidacy · Risk perception · HIV prevention · Men who have sex with men

Introduction

Pre-exposure prophylaxis (PrEP) is increasingly recognized as a critical component of HIV prevention strategies worldwide. However, the slow pace of regulatory approval and limited uptake of PrEP has constrained its measurable epidemiological impact to specific regions of the US [1–3], Australia [4] and the UK [5]. While macro-level structural factors such as regulatory approval, pricing, insurance coverage, and health system organization are major barriers to achieving the WHO target of reaching three million individuals with PrEP by 2020 [6], individual-level barriers to uptake are no less important [7–17].

Behavior change models are useful theoretical tools through which individuals' uptake of PrEP may be interrogated. A motivational PrEP cascade, based on the transtheoretical model [18], proposes that in order to reach PrEP persistence, an individual needs to go through the following five stages: Stage 1—Pre-contemplation; Stage 2—Contemplation; Stage 3—PrEParation; Stage 4—Initiation and Action; and Stage 5—Adherence and Maintenance [19]. Studies based on this model identified substantial drop-out of potential PrEP users at the early stages of the cascade among men who have sex with men (MSM) in the US and in China [19, 20]. Specifically, dramatic losses were observed in the Contemplation Stage, which requires an individual to be both (a) willing to use PrEP and (b) perceive himself to be an appropriate PrEP candidate [19, 20].

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MSM's willingness to use PrEP and factors associated with such willingness have been documented in a growing body of research in the US and low-and-middle income settings [21–26] and point to demographic (age, income, education) [27–31], structural (access to healthcare, affordability) [29, 32], behavioral (sexual practices, HIV testing frequencies) [27–29, 33, 34] and psychological factors (risk perception, stigma, perceived benefits/concerns) [28, 30, 34, 35].

Although individuals may deem PrEP use very acceptable and report high willingness to use, self-perception of PrEP candidacy (SPC), i.e. an individual's beliefs that he is an appropriate PrEP candidate [19], is critically important for moving across the motivational cascade towards PrEP initiation. However, less is known about SPC, and the relationship between SPC and intention to use PrEP or uptake behavior. A recent study that examined the relationship between SPC and behavioral indication for PrEP among MSM in France found that, compared to those who did not self-identify as PrEP candidates, MSM who did were more likely to meet risk-based PrEP eligibility criteria [36]. A US-based study identified lack of SPC as a potential barrier to PrEP use among MSM who were at high risk of HIV infection [37]. A recent qualitative study of young, black MSM in Atlanta found that individuals' self-perceived need for PrEP was low, despite many of them meeting guideline-based indication for PrEP [38]. These studies suggest that self-identifying as a person who would benefit from PrEP is critical to PrEP uptake. Perceiving oneself as an appropriate PrEP candidate may also lead to self-referral for PrEP, which has been shown to be associated with higher PrEP uptake compare to provider-initiated referrals [39]. Further research is needed to understand what differentiates those who self-identify as a person who would benefit from PrEP from those who do not.

High HIV prevalence and rapidly-growing incidence has been documented among MSM in China [40–43]. Although oral emtricitabine/tenofovir disoproxil fumarate (FTC/TDF) has not yet received regulatory approval for use as PrEP in China, the 2018 Chinese Guidelines for Diagnosis and Treatment of HIV/AIDS introduces PrEP as an effective biomedical prevention strategy [44]. This, along with a recently-launched government-supported PrEP demonstration project [45], suggests an increasing interest in adopting PrEP and exploring models for service delivery in China. In preparation for PrEP implementation in China, we conducted a study to investigate PrEP eligibility in a convenience sample of sexually-active MSM. In an exploratory analysis, we compared individuals' categorization as "PrEP-eligible" through the use of risk-based criteria to determine behavioral indication for PrEP versus SPC, and explored factors associated with SPC in order to provide evidence to inform the design of PrEP programs in China and beyond.

Methods

Procedures

Data was collected through a one-time survey in four cities (Beijing, Shanghai, Guangzhou and Changsha) in China, from March to May, 2018. Inclusion criteria were as follows: (1) aged 18 years or older; (2) assigned male at birth; (3) had sex with at least one male partner in the past 12 months; (4) HIV-negative according to self-report; and (5) willing and able to provide informed consent. We excluded men who self-reported as living with HIV/AIDS. 708 sexually-active, HIV-negative Chinese MSM were recruited through HIV voluntary counselling and testing (VCT) clinics (61%), peer referrals (23%), online (12%), and outreach at gay venues and community events (4%). After an online consent process, participants completed an online questionnaire independently or under the guidance of trained community-based organization (CBO) staff or research coordinators. Compensation ranged from $5 to $8 US dollars and was set in accordance to site-specific norms. Protocol and all study procedures were approved by the ethics review committee of Fudan University (Shanghai, China).

Measures

Self-Perception of PrEP Candidacy (SPC)

Our primary outcome was SPC (yes; no). Participants were asked: "Think about your situation, do you believe that you are currently an appropriate candidate for PrEP?" with response options from 1 "No, I am definitely not an appropriate candidate" to 5 "Yes, I am definitely an appropriate candidate". Men who answered "probably" or "definitely" were categorized as a self-perceived PrEP candidate.

Sexual Behaviors and Behavioral Indication for PrEP

We categorized participants into two groups: those who were behaviorally-indicated for PrEP and those who were not. As China does not currently have PrEP guidelines, we created criteria for behavioral indication for PrEP by combining modified US CDC PrEP eligibility criteria used by Parsons et al. [19] with three China-specific risk factors. These three factors were shown to be associated with incident HIV infection among Chinese MSM and have been included in an HIV risk assessment tool for MSM developed by the China CDC [46]. Men were considered behaviorally-indicated for PrEP if they met any of following criteria: (1) non-monogamous; (2) currently in a relationship with a partner who is

HIV-positive or of indeterminate HIV status; (3) had sex in the past 3 months with a casual male partner who is HIV-positive or of indeterminate HIV status; (4) had condomless anal sex with a casual male partner in the past 3 months; (5) had STI symptoms or diagnosed with an STI in the past 6 months; (6) had any male commercial sex partners in the past 6 months; (7) used recreational drugs (defined in the question to include methamphetamine, lysergic acid diethylamide (LSD), methylenedioxymethamphetamine (MDMA), ketamine, gamma-hydroxybutyrate (GBH), and other stimulants) in the past 6 months; (8) had any group sex with male sex partners in the past 6 months. The discrepancy in three-month and six-month behavioral history are due to differences between the US and Chinese criteria we followed.

HIV Risk Perception

We used three statements to measure HIV risk perception, including (1) "In 5 years, how likely do you think you would become infected with HIV?" with responses ranging from 1 "very unlikely" to 4 "very likely"; (2) "Are you worried that you will become infected with HIV?" with responses from 1 "not worried at all" to 4 "very worried"; and (3) "Do you know anyone who has seroconverted in the past 2 years?" (no; yes, only one; yes, more than one; and I don't know). We hypothesized that having someone who recently seroconverted in one's social network would influence one's HIV risk perception. These measures have previously been used in studies among Chinese MSM [20, 34].

Relationship Characteristics

We created two variables to characterize relationship characteristics: (1) gender of sex partners in the past 6 months. Participants were asked "in the past 6 months have you had sex with men or women or both" (only with men; more with men than with women; with women and men equally; more with women than men; only with women; I haven't had sex in the past six months). We categorized responses into only male partners, not only male partners, and no sex in the past 6 months. (2) Partnership type. Participants were asked "Do you have a primary male partner" (yes; no) then characterized their sexual relationship with their male primary partner (response options include: neither of us has sex with others, we are monogamous; we both have sex with others; only I have sex with others; I have sex with others, and I don't know what my partner does; I don't have sex with others, and I don't know what my partner does). We then categorized participants into four groups: (1) in a monogamous relationship with primary male partner; (2) in non-monogamous or other type of relationship with primary male partner; (3) not having a primary male partner; (4) no sex in the past six months.

HIV Testing Frequency

Participants were asked "how regularly do you receive HIV testing?" (I have never received any HIV testing; less than once per year; about once per year; about 2–3 times per year; at least 4 times per year).

Knowledge of PrEP Efficacy

We assessed participants' awareness of PrEP ("have you heard of PrEP?"); and accuracy of knowledge about PrEP efficacy ("how effective do you think PrEP is in preventing HIV?"). Participants who answered "more than 90% effective" were coded as having accurate knowledge of PrEP efficacy. We then categorized participants into three groups: (1) never heard of PrEP; (2) having incorrect knowledge of PrEP efficacy; (3) having correct knowledge of PrEP efficacy. All participants were provided with the following information about PrEP after completing questions about knowledge of PrEP efficacy and before answering the question about SPC.

> The HIV prevention pill (known as "PrEP") is a pill taken to prevent HIV. It is safe and more than 90% effective when taken daily. People who decide to use the oral HIV prevention pill need to return to their doctor every 3 months for HIV and STI testing, bloodwork, and a new prescription for the next 3 months.

Perceptions of PrEP and Condom Use

We developed 15 items to measure participants' perceptions of PrEP and condom use, including three subscales: (a) perceived concerns (7 items, alpha = 0.78), where higher score indicates more perceived concerns about PrEP; (b) perceived benefits (5 items, alpha = 0.76), with higher score indicating higher perceived benefits of PrEP; (c) stigma and disclosure (2 items, alpha = 0.84), higher scores indicating more perceived PrEP-related stigma and disclosure issues; and (d) one single item: condom use self-efficacy, higher scores indicating higher self-efficacy in condom use. Participants responded on 5-point Likert scale from 1 "strongly disagree" to 5 "strongly agree". We have described items that compose the scales and methods of scale development in a previous paper [20].

Demographic Characteristics

Participants were asked for their birth year, which was then computed to age, city of residence, residency status (i.e., whether they have local residency permit issued by

the government or not), education level, monthly income, marital status, and sexual orientation.

Statistical Analysis

We first described basic demographics of the cohort (Table 1) and categorized respondents into four groups in a two by two table displaying concordance in PrEP eligibility by behavioral indication and SPC (Table 2). We then conducted bivariable analyses to examine differences between those who did not self-perceive as PrEP candidates and those who did self-perceive as PrEP candidates. Next, we conducted a multivariable logistic regression to identify factors associated with SPC. Lastly, we restricted our analysis to those men who were behaviorally-indicated for PrEP (n = 323) and repeated the bivariable and multivariable analyses in order to understand—in a sample of men whose behavior was objectively associated with heightened risk of HIV acquisition—factors associated with SPC. To control for potential confounding, the multivariable analyses adjusted for demographic variables that were significant in bivariable analyses. All data analyses were completed in IBM SPSS Statistics 22.0 [47].

Results

Demographics and Behavioral Indication for PrEP

Of 708 respondents, 199 (28.1%) were from Shanghai, 201 (28.4%) from Beijing, 207 (29.2%) from Guangzhou, and 101 (14.3%) from Changsha. Age ranged from 18 to 85 years (mean = 31.5; standard deviation = 9.1). The majority identified as gay (67.9%) and reported having a college degree or above (69.6%). Over forty percent (42.1%) reported that they had never heard of PrEP prior to the survey, 25.8% had correct knowledge about PrEP efficacy, and 32.1% had incorrect knowledge about PrEP efficacy (Table 1). We found a low concordance rate between PrEP eligibility by behavioral indication versus by SPC (Cohen's kappa = 0.127) (Table 2). We identified 323 men (45.6%) as PrEP eligible by behavioral indication, among whom less than half (42.1%) self-identified as appropriate PrEP candidates. Conversely, among men who were not behaviorally-indicated for PrEP, nearly a third (29.6%) self-identified as appropriate PrEP candidates.

Bivariable and Multivariable Analyses of Factors Associated with SPC

Table 3 shows results from bivariable and multivariable analyses of the full sample (n = 708). In bivariable analysis, we found demographic factors (age, city of residence), sexual behaviors, relationship characteristics (sex of partners, partnership type), HIV risk perception (likelihood of becoming HIV infected, worried about becoming infected with, and know someone who seroconverted), HIV testing frequency, and perceptions of PrEP and condom use (perceived concerns, perceived benefits, stigma and disclosure, and condom use self-efficacy) were associated with SPC. In multivariable analysis, more frequent HIV testing (aOR = 1.63 $p = 0.009$), higher perceived benefits of PrEP (aOR = 1.80, $p < 0.001$), and lower condom use self-efficacy (aOR = 0.65, $p < 0.001$) remained significantly associated with SPC. However, sexual behaviors and relationship characteristics were no longer significant. In order to investigate whether individual risk behaviors might be associated with SPC, we ran an additional regression analysis to examine whether any of the eight criteria used to determine behavioral indication were associated with SPC and found that none were in the multivariable model (results not shown).

Table 4 shows results from bivariable and multivariable analyses of our restricted sample of 323 men who were behaviorally-indicated for PrEP. In bivariable analysis, SPC was associated with the following variables: city of residence, partnership type, HIV testing frequency, perceived benefits of PrEP, and condom use self-efficacy. In multivariable analysis, relationship characteristics remained significant: men who were in non-monogamous relationships with their primary male partners (aOR = 3.87, $p = 0.012$) and without a primary male partner (aOR = 4.56, $p = 0.004$) had higher odds of SPC. As in the full sample, those with higher scores on the perceived benefits of PrEP scale (aOR = 2.20, $p < 0.001$), and with lower condom use self-efficacy (aOR = 0.67, $p = 0.001$) had higher odds of SPC.

Discussion

To our knowledge, this is the first study to extend the early literature documenting a lack of association between behavioral indication for PrEP and self-perception of PrEP candidacy to a low and middle income setting. We found low concordance between behavioral indication for PrEP and SPC.

To further understand the mismatch, we conducted bivariable and multivariable analyses to examine factors associated with SPC in the full sample (n = 708) and a restricted sample of behaviorally-indicated men (n = 323). Results showed that rather than risk behavior, men's positive perceptions about PrEP were critical. Perceived benefits of PrEP were positively associated with SPC, while perceived concerns about PrEP did not have any association with SPC. This suggests that increasing awareness of the health and ancillary benefits of PrEP—such as potential for increased intimacy, decreased anxiety around HIV, and gaining more control over individual's sex lives—may increase SPC and thus the acceptance of PrEP among Chinese MSM.

Table 1 Sample characteristics (n = 708)

	N	(%)
Overall	708	(100)
Demographic characteristics		
Age		
< 30 years old	349	(49.3)
≥ 30 years old	359	(50.7)
City of residence		
Shanghai	199	(28.1)
Beijing	201	(28.4)
Changsha	101	(14.3)
Guangzhou	207	(29.2)
Residency status		
Local permanent residency permit	217	(30.6)
Local long-term residency permit	228	(32.2)
No local residency permit	263	(37.1)
Education level		
Below college	215	(30.4)
College	330	(46.6)
Above college	163	(23.0)
Monthly income		
< 5000 RMB	344	(48.6)
5000–9999 RMB	225	(31.8)
≥ 10000 RMB	139	(19.6)
Marital status		
Married	105	(14.8)
Unmarried	556	(78.5)
Divorced or widowed	47	(6.6)
Sexual orientation		
Bisexual	211	(29.8)
Gay	481	(67.9)
Other	16	(2.3)
Self-perception of PrEP candidacy (SPC)		
No	458	(64.7)
Yes	250	(35.3)
Behavioral indication for PrEP		
No	385	(54.4)
Yes	323	(45.6)
Sexual behavior		
Non-monogamous	128	(18.1)
In a relationship with a partner who is HIV-positive or of indeterminate HIV status	90	(12.7)
Had sex in the past 3 months with a casual male partner who is HIV-positive or of indeterminate HIV status	70	(9.9)
Had condomless anal sex with a casual male partner in the past 3 months	148	(20.9)
Had STI symptoms or were diagnosed with an STI in the past 6 months	23	(3.2)
Had any male commercial sex partners in the past 6 months	43	(6.1)
Used any recreational drugs in the past 6 months	10	(1.4)
Had any group sex with male sex partners in the past 6 months	76	(10.7)
HIV risk perception		
Likelihood of becoming infected with HIV in 5 years		
Very unlikely or unlikely	526	(74.3)
Likely or very likely	182	(25.7)

Table 1 (continued)

	N	(%)
Worried that you will become infected with HIV		
Not afraid at all or not very afraid	191	(27.0)
Somewhat afraid or very afraid	517	(73.0)
Know someone who seroconverted in the past 2 years		
Yes	253	(35.7)
No	332	(46.9)
I don't know	123	(17.4)
Relationship characteristics		
Gender of sex partners in the past 6 months		
Only men	501	(70.8)
Not only men	153	(21.6)
No sex	54	(7.6)
Partnership type		
Monogamous relationship with primary male partner	149	(21.0)
Non-monogamous or other type of relationship with primary male partner	190	(26.8)
No primary male partner	315	(44.5)
No sex in the past 6 months	54	(7.6)
HIV testing frequency		
Less than 2 times per year	323	(45.6)
2 times or more per year	385	(54.4)
Knowledge of PrEP efficacy		
Never heard of PrEP	298	(42.1)
Incorrect knowledge of PrEP efficacy	227	(32.1)
Correct knowledge of PrEP efficacy	183	(25.8)
	Mean	(SD)
Perceptions of PrEP and condom use		
Perceived concerns about PrEP	3.69	(0.67)
Perceived benefits of PrEP	3.52	(0.74)
PrEP-related stigma and disclosure	3.62	(1.11)
Condom use self-efficacy	3.22	(1.12)

RMB Ren Min Bi, official currency in China, *PrEP* Pre-exposure prophylaxis, *STI* sexually transmitted infection

Table 2 PrEP eligibility by behavioral indication versus self-perceived PrEP candidacy

	Did not self-perceive as PrEP candidate	Self-perceived PrEP candidate	Total
No behavioral indication for PrEP	271 (70.4%)	114 (29.6%)	385
Behavioral indication for PrEP	187 (57.9%)	136 (42.1%)	323
Total	458 (64.7%)	250 (35.3%)	708

$\chi^2(1) = 12.005$, $p = 0.001$

Cohen's kappa = 0.127

In addition, we found that men who reported lower condom use self-efficacy had higher odds of perceiving themselves as appropriate candidates for PrEP. This finding is logical and this self-awareness can operate to encourage men to identify alternative strategies to protect their sexual health. However, studies in the US have reported that potential or current PrEP users experience stigma because their decision to use PrEP has been equated with a desire to have condomless anal sex without consequences [9, 48], which decades of public health, medical, and cultural discourse have deemed problematic [49–52]. Rather than judging such decisions, it is important to validate men who recognize their own low condom use self-efficacy and indicate their willingness to try a new sexual health strategy either instead

Table 3 Factors associated with self-perceived PrEP candidacy: full sample analysis (n = 708)

	Bivariable analysis						Multivariable regression	
	Did not self-perceived as PrEP candidate		Self-perceived as PrEP candidate					
	n	(%)	n	(%)	χ^2	*P*	aOR (95% CI)	*P*
Overall	458	(64.7)	250	(35.3)				
Demographics								
Age					9.15	.003		
< 30 years old	245	(70.2)	104	(29.8)			Ref.	Ref.
≥ 30 years old	213	(59.3)	146	(40.7)			1.49 (1.03–2.16)	.035
City of residence					28.16	< .001		
Shanghai	111	(55.8)	88	(44.2)			Ref.	Ref.
Beijing	115	(57.2)	86	(42.8)			0.62 (0.38–1.00)	.051
Changsha	72	(71.3)	29	(28.7)			0.50 (0.28–0.88)	.016
Guangzhou	160	(77.3)	47	(22.7)			0.40 (0.25–0.65)	< .001
Behavioral indication for PrEP					12.01	.001		
No	271	(70.4)	114	(29.6)			Ref.	Ref.
Yes	187	(57.9)	136	(42.1)			1.10 (0.75–1.60)	.631
Relationship characteristics								
Gender of sex partners in the past 6 months					6.68	.035		
Only men	323	(64.5)	178	(35.5)			Ref.	Ref.
Not only men	92	(60.1)	61	(39.9)			1.28 (0.81–2.01)	.291
No sex in the past 6 months	43	(79.6)	11	(20.4)			0.82 (0.35–1.89)	.638
Partnership type					10.76	.013		
Monogamous relationship with primary male partner	106	(71.1)	43	(28.9)			Ref.	Ref.
Non-monogamous or other type of relationship with primary male partner	115	(60.5)	75	(39.5)			1.36 (0.80–2.29)	.253
No primary male partner	194	(61.6)	121	(38.4)			1.33 (0.81–2.17)	.261
No sex in the past 6 months[a]	43	(79.6)	11	(20.4)			–	–
HIV risk perception								
Likelihood of becoming infected with HIV in 5 years					8.02	.005		
Very unlikely or unlikely	356	(67.7)	170	(32.3)			Ref.	Ref.
Likely or very likely	102	(56.0)	80	(44.0)			1.47 (0.98–2.21)	.065
Worried about becoming infected with HIV					4.11	.051		
Not worried at all/not very worried	135	(70.7)	56	(29.3)			Ref.	Ref.
Somewhat worried/very worried	323	(62.5)	194	(37.5)			0.96 (0.63–1.45)	.838
Know someone who seroconverted in the past 2 years					6.57	.038		
No	231	(69.6)	101	(30.4)			Ref.	Ref.
Yes	152	(60.1)	101	(39.9)			1.18 (0.79–1.76)	.428
I don't know	75	(61.0)	48	(39.0)			1.23 (0.76–1.99)	.410
HIV testing frequency					18.24	< .001		
Less than 2 times per year	236	(73.1)	87	(26.9)			Ref.	Ref.
2 times or more per year	222	(57.7)	163	(42.3)			**1.63 (1.13–2.36)**	**.009**
	Mean	(SD)	Mean	(SD)	*t*	*p*		
Perceptions of PrEP and condom use								
Perceived concerns about PrEP	3.73	(0.67)	3.62	(0.66)	2.05	.040	0.95 (0.70–1.31)	.771
Perceived benefits of PrEP	3.42	(0.75)	3.70	(0.67)	−5.05	< .001	**1.80 (1.40–2.32)**	**< .001**
PrEP-related stigma and disclosure	3.69	(1.06)	3.48	(1.17)	2.29	.022	0.88 (0.73–1.06)	.182
Condom use self-efficacy	3.42	(1.08)	2.86	(1.11)	6.49	< .001	**0.65 (0.55–0.77)**	**< .001**

For the bivariable analysis, only significant results are shown in bold. The level of significance was set at $p \leq 0.05$

The multivariable analyses adjusted for demographic variables that were significant in bivariable analyses

[a]Multivariable analysis results of this categorical variable were not shown due to small value

Table 4 Factors associated with SPC: restricted analysis among PrEP eligible men (n = 323)

	Did not self-perceived as PrEP candidate		Bivariable analysis				Multivariable regression	
			Self-perceived as PrEP candidate					
	n	(%)	n	(%)	χ^2	*P*	aOR (95% CI)	*P*
Overall	187	(57.9)	136	(42.1)				
Demographics								
City of residence					22.64	< .001		
Shanghai	40	(44.0)	51	(56.0)			Ref.	Ref.
Beijing	58	(51.8)	54	(48.2)			0.71 (0.38–1.31)	.269
Changsha	24	(68.6)	11	(31.4)			0.40 (0.16–0.99)	.049
Guangzhou	65	(76.5)	20	(23.5)			0.33 (0.16–0.66)	.002
Relationship characteristics								
Partnership type[a]					12.76	.003		
Monogamous relationship with primary male partner	28	(82.4)	6	(17.6)			Ref.	Ref.
Non-monogamous or other type of relationship with primary male partner	66	(57.9)	48	(42.1)			**3.87 (1.35–11.13)**	**.012**
No primary male partner	90	(52.3)	82	(47.7)			**4.56 (1.61–12.95)**	**.004**
No sex in the past 6 months[b]	3	(100.0)	0	(0.0)			–	–
HIV testing frequency					6.27	.015		
Less than 2 times per year	82	(66.7)	41	(33.3)			Ref.	Ref.
2 times or more per year	105	(52.5)	95	(47.5)			1.68 (1.00–2.84)	.052
	Mean	(SD)	Mean	(SD)	*t*	*p*	aOR (95%CI)	*p*
Perceptions of PrEP and condom use								
Perceived benefits of PrEP	3.47	(0.75)	3.78	(0.61)	−3.93	< .001	**2.20 (1.52–3.20)**	**< .001**
Condom use self-efficacy	3.32	(1.13)	2.84	(1.10)	3.74	< .001	**0.67 (0.54–0.84)**	**.001**

For the bivariable analysis, only significant results are shown in bold. The level of significance was set at $p \leq 0.05$

The multivariable analyses adjusted for demographic variables that were significant in bivariable analyses

[a]Fisher's exact test was used for these calculations due to small expected values

[b]Multivariable analysis results of this categorical variable were not shown due to small value

of or in addition to strategies they already use to prevent HIV. Providers need to expand beyond a condom-use only paradigm to integrate the new reality of biomedical HIV prevention into their interactions with individuals and support their decisions around condom use rather than further stigmatizing those who are unable/unwilling to use condoms [53]. As PrEP implementation is still in its infancy in China and much of the world, it is an ideal time for public health authorities and front-line HIV prevention workers to develop culturally-appropriate counselling to support client-centric decision-making around condom use and PrEP.

More frequent HIV testing behavior was also positively-associated with SPC in the full sample analysis. In China, although there has been an increased effort in promoting self-testing and internet-based HIV testing services [54–56], VCT sites operated by MSM CBOs are the primary sites through which MSM access HIV testing and counselling services [54, 55, 57, 58]. It is possible that men who tested more frequently were more engaged with HIV-related CBOs and more likely to receive information and/or education about HIV prevention strategies, including PrEP. While our study was not able to explore the mechanism through which HIV testing behavior impacts SPC, our results suggest that HIV testing sites may be good venues through which to link men to PrEP services or even provide PrEP directly. More research is needed to understand the relationship between HIV testing practices and SPC, and how to leverage men's regular HIV testing habits to develop strategies for PrEP engagement.

In our analysis restricted to behaviorally-indicated men, relationship characteristics (not having a primary partner; in a non-monogamous relationship with primary partner) showed associations with SPC. Our results echo findings from studies conducted in the US that inter-personal factors such as relationship dynamics [59], intimacy motivations [60], and sexual agreement between couples [61] are critical to PrEP uptake decisions. Therefore, we suggest that counseling around PrEP uptake should include discussions about interpersonal factors rather than being limited to an individual's behavior [60, 62–65].

Our study provides data in support of recent recommendations by PrEP researchers in the US [48, 53] who call for a more universal approach to PrEP that does not restrict access to PrEP by risk criteria but instead introduces PrEP as a part of comprehensive HIV prevention package. While the use of risk assessment tools to identify PrEP candidates stems from other disease fields where this approach has been shown feasible and effective [66–69], recent studies have identified three issues with the use of risk assessment tools for identifying PrEP candidates: (a) low sensitivity in identifying groups who might benefit PrEP the most [62, 70]; (b) failure to increase PrEP uptake after presentation of an objective risk score to "high-risk" MSM [71]; and (c) exacerbation of PrEP stigma from the experience of undergoing risk assessments [48]. In response to these limitations, researchers have recommended the use of a shared-decision making process for determining PrEP use [48, 53]. Shared decision making is a process which empowers individuals to make informed decisions over treatment alternatives in collaboration with their medical provider [72]. Instead of conducting risk assessment and framing PrEP as a prevention strategy for "high risk" populations, providers could use behavioral indications of PrEP to *guide* their conversation with potential PrEP users [53], emphasize clients' sexual health concerns and goals, and discuss how different HIV prevention strategies could help achieve their goals [48]. Instead of relying on risk-based criteria to identify PrEP candidates, findings from our study suggest that shared decision-making approaches are needed to support individuals to assess whether they are an appropriate PrEP candidate based on their sexual health goals, lifestyles, relationship dynamics and other factors.

The study has several limitations. First, the survey was conducted at a time when PrEP was not officially available in China. Research will be needed to examine whether our hypothesized relationship between SPC and PrEP uptake, rather than objective risk criteria and PrEP uptake, is borne out once PrEP is more widely available. Second, the cross-sectional nature of our study limits our ability to infer causal relationships. For example, we found HIV testing frequency was associated with SPC, but we are not able to establish causality between the two variables. Third, data was collected in a convenience sample. It is possible that MSM who are less networked to CBOs, HIV testing services, and peers may be substantively different from those reached in our study. Therefore, results from our study may not generalizable to MSM who are more "hidden" in this high-stigma context.

Despite limitations, our study's finding of the discordance between behavioral indication for PrEP and self-perception of PrEP candidacy has important implications for the design of PrEP services. The fact that risk behavior did not drive individual's self-perception of PrEP candidacy should prompt further research to deepen our understanding of the concept of SPC. At a time when PrEP is expected to soon become available in China, results from our study point to the need to develop and test strategies beyond standard risk assessment criteria to promote PrEP among sexually-active MSM so that uptake of this highly-effective biomedical HIV prevention strategy can be rapid and broad.

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Compliance with Ethical Standards

Conflict of interest The authors declare that they have no conflict of interest.

Ethical Approval All procedures performed in this study were in accordance with the ethical standards of the Ethics Review Committee of Fudan University, Shanghai, China (IRB00002408 & FWA00002399) and with the 1964 Helsinki declaration and its later amendments.

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

References

1. Sullivan P, Smith K, Mera-Giler R, Siddiqi A, Gunnels B, Harris N, et al. The impact of pre-exposure prophylaxis with TDF/FTC on HIV diagnoses, 2012–2016, United States. Abstract number: LBPEC036. 22nd International AIDS Conference (AIDS 2018); Amsterdam, the Netherlands 2018.
2. San Francisco Department of Public Health. HIV Epidemiology Annual Report 2017. Population Health Division SF. 2017.
3. The New York City Department of Health and Mental Hygiene. Bureau of Sexually Transmitted Disease Control Quarterly Report (2017: 4th Quarter). 2018.
4. Grulich AE, Guy R, Amin J, Jin F, Selvey C, Holden J, et al. Population-level effectiveness of rapid, targeted, high-coverage roll-out of HIV pre-exposure prophylaxis in men who have sex with men: the EPIC-NSW prospective cohort study. Lancet HIV. 2018;5(11):e629–37.
5. Brown A, Kirwan P, Chau C, Khawam J, Gill N, Delpech V. Towards elimination of HIV transmission, AIDS and HIV-related deaths in the UK. In: Public Health England, Editor. 2017.

6. Coleman R. Setting the scene, setting the targets. The Joint United Nations Programme on HIV/AIDS prevention targets of 2016 and estimating global pre-exposure prophylaxis targets. CSIRO Sex Health. 2018;15(6):485–8.
7. 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;89(3):207–11.
8. Allen E, Gordon A, Krakower D, Hsu K. HIV preexposure prophylaxis for adolescents and young adults. Curr Opin Pediatr. 2017;29(4):399–406.
9. Calabrese SK, Underhill K. How stigma surrounding the use of HIV preexposure prophylaxis undermines prevention and pleasure: a call to destigmatize "Truvada Whores". Am J Public Health. 2015;105(10):1960–4.
10. Eaton LA, Kalichman SC, Price D, Finneran S, Allen A, Maksut J. Stigma and conspiracy beliefs related to pre-exposure prophylaxis (PrEP) and interest in using PrEP among black and white men and transgender women who have sex with men. AIDS Behav. 2017;21(5):1236–46.
11. 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 STDs. 2013;27(4):248–54.
12. Grov C, Whitfield THF, 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;19(12):2234–44.
13. Haire BG. Preexposure prophylaxis-related stigma: strategies to improve uptake and adherence—a narrative review. HIV/AIDS (Auckl). 2015;7:241–9.
14. Plotzker R, Seekaew P, Jantarapakde J, Pengnonyang S, Trachunthong D, Linjongrat D, et al. Importance of risk perception: predictors of PrEP acceptance among Thai MSM and TG women at a community-based health service. J Acquir Immune Defic Syndr. 2017;76(5):473–81.
15. Underhill K, Guthrie KM, Colleran C, Calabrese SK, Operario D, Mayer KH. Temporal fluctuations in behavior, perceived HIV risk, and willingness to use pre-exposure prophylaxis (PrEP). Arch Sex Behav. 2018;47(7):2109–21.
16. Van der Elst EM, Mbogua J, Operario D, Mutua G, Kuo C, Mugo P, 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 Behav. 2013;17(6):2162–72.
17. Ware NC, Wyatt MA, Haberer JE, Baeten JM, Kintu A, Psaros C, et al. What's love got to do with it? Explaining adherence to oral antiretroviral pre-exposure prophylaxis for HIV-serodiscordant couples. J Acquir Immune Defic Syndr. 2012;59(5):463–8.
18. Prochaska JO, Velicer WF. The transtheoretical model of health behavior change. Am J Health Promot. 1997;12(1):38–48.
19. Parsons JT, Rendina HJ, Lassiter JM, Whitfield TH, Starks TJ, Grov C. Uptake of HIV pre-exposure prophylaxis (PrEP) in a national cohort of gay and bisexual men in the United States: the motivational PrEP cascade. J Acquir Immune Defic Syndr. 2017;74(3):285.
20. Wu Y, Xie L, Meng S, Hou J, Fu R, Zheng H, et al. Mapping potential pre-exposure prophylaxis users onto a motivational cascade: identifying targets to prepare for implementation in China. LGBT Health. 2019. https://doi.org/10.1089/lgbt.2018.0256.
21. Peng P, Su S, Fairley CK, Chu M, Jiang S, Zhuang X, et al. A global estimate of the acceptability of pre-exposure prophylaxis for HIV among men who have sex with men: a systematic review and meta-analysis. AIDS Behav. 2018;22(4):1063–74.
22. Yi S, Tuot S, Mwai GW, Ngin C, Chhim K, Pal K, et al. Awareness and willingness to use HIV pre-exposure prophylaxis among men who have sex with men in low-and middle-income countries: a systematic review and meta-analysis. J Int AIDS Soc. 2017;20(1):21580.
23. Bourne A, Cassolato M, Thuan Wei CK, Wang B, Pang J, Lim SH, et al. Willingness to use pre-exposure prophylaxis (PrEP) for HIV prevention among men who have sex with men (MSM) in Malaysia: findings from a qualitative study. J Int AIDS Soc. 2017;20(1):21899.
24. To KW, Lee SS. HIV pre-exposure prophylaxis in South East Asia: a focused review on present situation. Int J Infect Dis. 2018;77:113–7.
25. Chakrapani V, Newman P, Shunmugam M, Mengle S, Varghese J, Nelson R, et al. Acceptability of HIV Pre-exposure prophylaxis (prep) and implementation challenges among men who have sex with men in India: a qualitative investigation. AIDS Patient Care STDs. 2015;10:569–77.
26. Wang X, Bourne A, Liu P, Sun J, Cai T, Mburu G, et al. Understanding willingness to use oral pre-exposure prophylaxis for HIV prevention among men who have sex with men in China. PLoS ONE. 2018;13(6):e0199525.
27. Ding Y, Yan H, Ning Z, Cai X, Yang Y, Pan R, et al. Low willingness and actual uptake of pre-exposure prophylaxis for HIV-1 prevention among men who have sex with men in Shanghai China. Biosci Trends. 2016;10(2):113–9.
28. Draper BL, Oo ZM, Thein ZW, Aung PP, Veronese V, Ryan C, et al. Willingness to use HIV pre-exposure prophylaxis among gay men, other men who have sex with men and transgender women in Myanmar. J Int AIDS Soc. 2017;20(1):21885.
29. Hoagland B, De Boni RB, Moreira RI, Madruga JV, Kallas EG, Goulart SP, et al. Awareness and willingness to use pre-exposure prophylaxis (PrEP) among men who have sex with men and transgender women in Brazil. AIDS Behav. 2017;21(5):1278–87.
30. 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;16(7):1853–61.
31. 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.
32. Mimiaga MJ, Case P, Johnson CV, Safren SA, Mayer KH. Pre-exposure antiretroviral prophylaxis attitudes in high-risk Boston area men who report having sex with men: limited knowledge and experience but potential for increased utilization after education. J Acquir Immune Defic Syndr. 2009;50(1):77–83.
33. 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;88(4):258–63.
34. Meyers K, Wu Y, Qian H, Sandfort T, Huang X, Xu J, et al. Interest in long-acting injectable PrEP in a cohort of men who have sex with men in China. AIDS Behav. 2018;22(4):1217–27.
35. Eaton LA, Driffin DD, Smith H, Conway-Washington C, White D, Cherry C. Psychosocial factors related to willingness to use pre-exposure prophylaxis for HIV prevention among Black men who have sex with men attending a community event. Sex Health. 2014;11(3):244–51.
36. Dubin S, Goedel WC, Park SH, Hambrick HR, Schneider JA, Duncan DT. Perceived candidacy for pre-exposure prophylaxis (PrEP) among men who have sex with men in Paris France. AIDS Behav. 2018. https://doi.org/10.1007/s10461-018-2279-y.
37. Gallagher T, Link L, Ramos M, Bottger E, Aberg J, Daskalakis D. Self-perception of HIV risk and candidacy for pre-exposure prophylaxis among men who have sex with men testing for HIV

at commercial sex venues in New York City. LGBT Health. 2014;1(3):218–24.
38. Lockard A, Rosenberg ES, Sullivan PS, Kelley CF, Serota DP, Rolle CM, et al. Contrasting self-perceived need and guideline-based indication for HIV pre-exposure prophylaxis among Young, Black Men who have sex with men offered pre-exposure prophylaxis in Atlanta Georgia. AIDS Patient Care STDs. 2019;33(3):112–9.
39. Cohen SE, Vittinghoff E, Bacon O, Doblecki-Lewis S, Postle BS, Feaster DJ, et al. High interest in pre-exposure prophylaxis among men who have sex with men at risk for HIV-infection: baseline data from the US PrEP demonstration project. J Acquir Immune Defic Syndr (1999). 2015;68(4):439.
40. Cui Y, Guo W, Li D, Wang L, Shi CX, Brookmeyer R, et al. Estimating HIV incidence among key affected populations in China from serial cross-sectional surveys in 2010–2014. J Int AIDS Soc. 2016;19(1):20609.
41. Zhang W, Xu JJ, Zou H, Zhang J, Wang N, Shang H. HIV incidence and associated risk factors in men who have sex with men in Mainland China: an updated systematic review and meta-analysis. Sex Health. 2016;13(4):373–82.
42. Wang QQ, Chen XS, Yin YP, Liang GJ, Zhang RL, Jiang N, et al. HIV prevalence, incidence and risk behaviours among men who have sex with men in Yangzhou and Guangzhou, China: a cohort study. J Int AIDS Soc. 2014;17:18849.
43. Mao X, Wang Z, Hu Q, Huang C, Yan H, Wang Z, et al. HIV incidence is rapidly increasing with age among young men who have sex with men in China: a multicentre cross-sectional survey. HIV Med. 2018;19(8):513–22.
44. AIDS and Hepatitis C Professional Group, Society of Infectious Diseases, Chinese Medical Association; Chinese Center for Disease Control and Prevention. [Chinese guidelines for diagnosis and treatment of HIV/AIDS (2018)]. Zhonghua nei ke za zhi. 2018;57(12):867–84.
45. Study protocol: A multicenter, real-world study on two oral Truvada approaches to prevention HIV infection among men who have sex with men. 2017ZX10201101 2017. http://www.chictr.org.cn/hvshowproject.aspx?id=12652.
46. Li L, Jiang Z, Song W, Ding Y, Xu J, He N. [Chinese] Constructing an HIV risk assessment tool for MSM using the Delphi method. Chin J Epidemiol. 2017;38(10):1426–30.
47. IBM. SPSS Statistics, Version 22.0. New York: IBM Corp. 2014.
48. Golub SA. PrEP stigma: implicit and explicit drivers of disparity. Curr HIV/AIDS Rep. 2018;15:1–8.
49. Dubov A, Galbo P Jr, Altice FL, Fraenkel L. Stigma and shame experiences by MSM who take PrEP for HIV prevention: a qualitative study. Am J Mens Health. 2018;12(6):1843–54.
50. Jaspal R, Nerlich B. Polarised press reporting about HIV prevention: social representations of pre-exposure prophylaxis in the UK press. Health (London). 2017;21(5):478–97.
51. Brooks RA, Landrian A, Nieto O, Fehrenbacher A. Experiences of anticipated and enacted pre-exposure prophylaxis (PrEP) stigma among Latino MSM in Los Angeles. AIDS Behav. 2019;23(7):1–10.
52. Spieldenner A. PrEP whores and HIV prevention: the queer communication of HIV pre-exposure prophylaxis (PrEP). J Homosex. 2016;63(12):1685–97.
53. Calabrese SK, Krakower DS, Willie TC, Kershaw TS, Mayer KH. US guideline criteria for HIV pre-exposure prophylaxis: clinical considerations and caveats. Clin Infect Dis. 2019. https://doi.org/10.1093/cid/ciz046.
54. Wang X, Wu Z, Tang Z, Nong Q, Li Y. Promoting HIV testing with home self-test kit among men who have sex with men in China: a feasibility study. The Lancet. 2015;386:S68.
55. Han L, Bien CH, Wei C, Muessig KE, Yang M, Liu F, et al. HIV self-testing among online MSM in China: implications for expanding HIV testing among key populations. J Acquir Immune Defic Syndr. 2014;67(2):216.
56. Tang W, Wei C, Cao B, Wu D, Li KT, Lu H, et al. Crowdsourcing to expand HIV testing among men who have sex with men in China: a closed cohort stepped wedge cluster randomized controlled trial. PLoS Med. 2018;15(8):e1002645.
57. Wei C, Yan H, Yang C, Raymond HF, Li J, Yang H, et al. Accessing HIV testing and treatment among men who have sex with men in China: a qualitative study. AIDS Care. 2014;26(3):372–8.
58. Liu C, Mao J, Wong T, Tang W, Tso LS, Tang S, et al. Comparing the effectiveness of a crowdsourced video and a social marketing video in promoting condom use among Chinese men who have sex with men: a study protocol. BMJ Open. 2016;6(10):e010755.
59. Saberi P, Gamarel KE, Neilands TB, Comfort M, Sheon N, Darbes LA, et al. Ambiguity, ambivalence, and apprehensions of taking HIV-1 pre-exposure prophylaxis among male couples in San Francisco: a mixed methods study. PLoS ONE. 2012;7(11):e50061.
60. 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. Ann Behav Med. 2014;49(2):177–86.
61. Mitchell JW, Lee J-Y, Woodyatt C, Bauermeister J, Sullivan P, Stephenson R. HIV-negative male couples' attitudes about pre-exposure prophylaxis (PrEP) and using PrEP with a sexual agreement. AIDS Care. 2016;28(8):994–9.
62. Lancki N, Almirol E, Alon L, McNulty M, Schneider J. PrEP guidelines have low sensitivity for identifying seroconverters in a sample of Young Black men who have sex with men in Chicago. AIDS. 2018;32(3):383–92.
63. Zarwell M, Ransome Y, Barak N, Gruber D, Robinson WT. PrEP indicators, social capital and social group memberships among gay, bisexual and other men who have sex with men. Cult Health Sex. 2019. https://doi.org/10.1080/13691058.2018.1563912.
64. Phillips G, Neray B, Birkett M, Felt D, Janulis P, Mustanski B. Role of social and sexual network factors in PrEP utilization among YMSM and transgender women in Chicago. Prev Sci. 2019. https://doi.org/10.1007/s11121-019-00995-6.
65. Dubov A, Altice FL, Fraenkel L. An information–motivation–behavioral skills model of PrEP uptake. AIDS Behav. 2018;22(11):3603–16.
66. Bitton A, Gaziano T. The Framingham Heart Study's impact on global risk assessment. Prog Cardiovasc Dis. 2010;53(1):68–78.
67. Blake GM, Fogelman I. The role of DXA bone density scans in the diagnosis and treatment of osteoporosis. Postgrad Med J. 2007;83(982):509–17.
68. Noble D, Mathur R, Dent T, Meads C, Greenhalgh T. Risk models and scores for type 2 diabetes: systematic review. BMJ. 2011;343:d7163.
69. Wilson PW, D'Agostino RB, Levy D, Belanger AM, Silbershatz H, Kannel WB. Prediction of coronary heart disease using risk factor categories. Circulation. 1998;97(18):1837–47.
70. Hoots BE, Finlayson T, Nerlander L, Paz-Bailey G, Group NHBSS, Wortley P, et al. Willingness to take, use of, and indications for pre-exposure prophylaxis among men who have sex with men—20 US cities, 2014. Clin Infect Dis. 2016;63(5):672–7.
71. Blumenthal J, Jain S, Mulvihill E, Sun S, Hanashiro M, Ellorin E, et al. Perceived versus calculated HIV risk: Implications for Pre-exposure prophylaxis uptake in a randomized trial of men who have sex with men. J Acquir Immune Defic Syndr. 9000; Publish Ahead of Print.
72. Barry MJ, Edgman-Levitan S. Shared decision making—the pinnacle of patient-centered care. N Engl J Med. 2012;366(9):780–1.