



Perceived Candidacy for Pre-exposure Prophylaxis (PrEP) Among Men Who Have Sex with Men in Paris, France

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Published online: 24 September 2018
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Abstract

Low perception of HIV risk is a challenge to PrEP implementation. We analyzed associations between perceptions of PrEP candidacy, behavioral indications for PrEP, and sexual behaviors. We recruited a sample of 580 MSM from a geosocial-networking smartphone application in Paris, France. A modified Poisson regression model was conducted to examine associations between perceived candidacy for PrEP and behavioral indications for PrEP, and relationships among engagement in group sex, transactional sex, HIV test history, and indications for PrEP. Adjusted risk ratios (aRR) and 95% confidence intervals (CIs) were calculated. For the outcome of perceived candidacy for PrEP, a multinomial logistic regression was performed, and adjusted relative risk ratios (aRRR) were calculated. Multivariate analyses were adjusted for socio-demographics. Respondents who considered themselves PrEP candidates were more likely to meet PrEP eligibility criteria compared to those who did not consider themselves candidates (aRR 1.65; 95% CI 1.34–2.03). Those who had engaged in group or transactional sex were more likely to have behavioral indications for PrEP (aRR 1.27; 95% CI 1.07–1.50, aRR 1.32; 95% CI 1.13–1.56, respectively), whereas HIV test history was not significantly associated with behavioral indications for PrEP. Respondents who had engaged in group sex or transactional sex were more likely to perceive themselves as candidates for PrEP (aRRR 2.24; 95% CI 1.21–4.16, aRRR 2.58; 95% CI 1.09–6.13, respectively), although those never tested for HIV were less likely to perceive themselves as candidates for PrEP (aRRR 0.18; 95% CI 0.03–0.91). The elucidation of candidacy perceptions and risk behaviors is key to furthering the effective implementation of PrEP engagement interventions.

Keywords Pre-exposure prophylaxis · Candidacy · HIV prevention · Men who have sex with men · Geosocial-networking smartphone application

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Introduction

HIV remains a global health concern despite continuing advances in biomedical interventions and increasing prevention and treatment efforts. HIV has varying prevalence along both geographic and socio-demographic lines, and a need for targeted interventions remains throughout the world [1]. In Western Europe, men who have sex with men (MSM) are disproportionately impacted by the HIV epidemic [2]. Estimated HIV prevalence among MSM remains over 10% in nine Western European nations with the highest proportion of HIV incidence reported to be in MSM [3, 4]. In France, overall HIV incidence has decreased in multiple socio-demographic groups, but has persisted at a higher rate in MSM [5, 6], a group that accounts for 3.9% of the male population [7] but represented over a third of all new infections among men in 2015 [3]. The need for HIV interventions in French MSM is a pressing public health problem.

Clinical trials have established the efficacy of oral emtricitabine and tenofovir disoproxil fumarate (FTC-TDF) as pre-exposure prophylaxis (PrEP) for HIV in MSM, globally with the iPrEx trials [8] and in the UK with the PROUD trial [9]. Clinical trials have also shown that various oral FTC-TDF dose regimens can significantly reduce HIV acquisition: reductions of 92% were seen when taken daily [8] and by 86% when taken in an event-driven, intermittent dosing regimen (two pills before a sexual encounter and two pills after) [10]. Results from clinical practice settings, where no new HIV infections with PrEP use were reported, have affirmed the utility of PrEP in HIV prevention in non-trial settings [11]. PrEP became widely available for use in France in January 2016 in both daily and so-called “on-demand” or “event-driven” dosing regimens [12]. In the first 6 months of PrEP implementation in France, the majority of PrEP recipients (96.4%) were MSM and 65.2% used the on-demand dosing regimen [12]. The efficacy of PrEP as an HIV intervention, its recent roll-out in France, and the disproportionate disease burden of HIV infection in French MSM all support efforts to scale-up PrEP as an efficacious biomedical intervention for HIV.

Despite the efficacy of PrEP as an HIV intervention in MSM populations, uptake has been slow and there are setbacks to realizing its full potential [13]. Since the approval of FTC-TDF as PrEP in the US by the FDA in 2012, researchers have characterized “cascade” models of PrEP utilization in order to better design and implement PrEP interventions [14]. The steps of awareness, uptake, adherence, and retention in PrEP use have been identified as critical juncture points for interventions [14, 15]. Low perception of HIV risk [16] as well as challenges

to awareness and motivation among MSM have been described as the point of “the most dramatic losses” from the PrEP utilization cascade [17]. In both the US [18–20] and Europe [21, 22], low levels of PrEP awareness have been documented as well as low awareness among multiple MSM demographics [23, 24]. For instance, in a national population of US MSM, a majority of participants were candidates for PrEP, but fewer than 1 in 10 were using and adherent due in part to unwillingness to take PrEP or belief that they were not appropriate candidates [17]. Effective interventions to decrease HIV incidence through PrEP use will need to foster motivation and awareness among MSM.

Effective interventions to increase PrEP uptake should target high-risk MSM with low awareness or motivation to use PrEP. Candidacy for PrEP varies somewhat between US and European definitions, but in France, candidacy for PrEP among MSM is defined by: (1) condomless anal intercourse (CAI) with at least two different partners in the past six months, (2) any episode of an STI (i.e. syphilis, chlamydia, gonorrhea, Hepatitis B Virus, Hepatitis C Virus) over the last 12 months, (3) multiple post-exposure prophylaxis (PEP) treatments in the last 12 months, and (4) use of drugs during sexual intercourse [5]. There is no conclusive trend in the literature on whether MSM who engage in high-risk behaviors, i.e., are objective candidates, are more likely to be interested in or aware of PrEP. Many studies have found no association between risk and interest or awareness [18, 19, 25–27], while others have found some objectively high-risk MSM were more interested in or aware of PrEP [28–32]. Similarly, studies have found a varying degree of association between interest in and motivation for PrEP uptake across demographic variables such as age, education level, and/or race/ethnicity [18, 24, 26, 30, 31, 33–36]. The variation in findings among interest, motivation, risk behavior, and socio-demographics speaks to the need to characterize population-specific PrEP perceptions and behaviors as part of an effort to create targeted and effective interventions to improve PrEP implementation.

To better characterize self-perceptions of PrEP candidacy and associated risk behaviors among French MSM, we examined the relationship between perception of PrEP candidacy with the presence of behavioral indications for PrEP use and related behaviors in a sample of MSM in Paris, France. Our analysis sought to elucidate what behavioral associations, if any, are seen in French MSM who meet PrEP candidacy criteria (i.e., who are objective, rather than self-perceived, PrEP candidates). Additionally, we aimed to assess the extent of self-perceptions of appropriateness of PrEP as a risk reduction strategy and the presence of behavioral indications for PrEP. Elucidating these factors serves as a means to create targeted and population-specific interventions to increase uptake at the awareness and motivation steps of the PrEP care continuum [16].

Methods

Data Collection

Our data collection methods have been previously described [37, 38]. In brief, this study utilized broadcast advertisements on a popular geosocial-networking smartphone application used by MSM to meet romantic and sexual partners for recruitment in October 2016 in the Paris, France metropolitan area. In accordance with previous research [38], users were shown an advertisement with text encouraging them to click through the advertisement to complete an anonymous web-based survey. The survey was incentivized by entry into a lottery for a prize equivalent to \$70 USD. The survey took an average of 11.4 min (SD=4.0) for users to complete. The survey was offered in French and English; 94.3% took the survey in French, and the overall response rate of 11.1%. Duplicates were assessed using IP addresses; none were apparent. All protocols were approved by our institution's Institutional Review Board prior to data collection. All respondents reported being at least 18 years old at the time of survey administration.

Measures

Condomless Anal Intercourse

Participants indicated the total number of partners with whom they had had condomless insertive anal intercourse and condomless receptive anal intercourse in the preceding 3 months. These count variables were transformed into categorical variables with two categories (0 or 1 partners and 2 or more partners). The study assessed any condomless anal intercourse, including condomless insertive anal intercourse or condomless receptive anal intercourse.

Engagement in Group Sex

Research has shown associations between group sex and HIV acquisition risk [39]. We assessed engagement in group sex events with the question, “Have you ever had group sex (sex with three or more people during a single sexual encounter)?” Response options were: “Yes, in the last three months”; “Yes, but not in the last three months”; and “No”. For analyses, we dichotomized it to be “Yes” (indicating any group sex) and “No” to create lifetime group sex variable.

Engagement in Transactional Sex

Participants were asked to answer the question ““Have you ever exchanged sex for money, drugs, food or shelter using a smartphone app?”” to assess engagement in transactional sex. Response options were “Yes” and “No.” If answered with “Yes”, there were four “Yes” options, including; (1) “Yes in the last three months and I did use a smartphone app”; (2) “Yes, in the last three months but I did not use a smartphone app”; (3) “Yes, not in the last three months and I did use a smartphone app”; and (4) “Yes, not in the last three months but I did not use a smartphone app”. For analyses, we dichotomized the variable into “Yes” (indicating any transactional sex) and “No” given the limited number of respondents in general and those who had engaged in transactional sex.

Sexually Transmitted Infections (STIs)

To ascertain recent diagnoses with various STIs participants were asked, “In the past year, have you been diagnosed with any of the following?” Participants were asked to select from a list of six common sexually transmitted infections—gonorrhea, chlamydia, syphilis, herpes simplex virus (HSV), human papillomavirus (HPV), and hepatitis C (HCV). A dichotomous variable was created to indicate any recent STI diagnosis versus no recent STI diagnosis for only responses that included gonorrhea, chlamydia, syphilis, and HCV.

Substance Use During Sexual Encounters

We used the question “How many times in the past three months have you or your partners used alcohol or drugs before or during sex? “to ascertain substance use during sexual encounters. For analysis we dichotomized responses that indicated any substance use during sexual encounters as “yes” and no reported substance use during sexual encounters as “no”.

HIV Test History

Participants were asked the question “How long has it been since your last HIV test?” Response options included (1) fewer than 3 months, (2) 3–6 months, (3) 6–12 months, (4) more than 12 months, and (5) never been tested. For this analysis we dichotomized responses that indicated prior HIV test history into “12 months ago or less” and “more than 12 months ago”.

Perceived PrEP Candidacy

Participants were asked the question “Do you believe that you are currently an appropriate candidate for PrEP?”

Response options included (1) “Yes, I am definitely an appropriate candidate”, (2) “I’m not sure who is an appropriate candidate”, and (3) “No, I am definitely not an appropriate candidate”. In this analysis we did not include participants who had indicated past-PrEP use.

Objective PrEP Candidacy

We created a dichotomous variable to indicate any behavioral indication for PrEP. If any of the dichotomized variables indicating condomless anal intercourse with two or more partners, recent sexually transmitted infection, or substance use during sexual encounters were reported, this was analyzed as objective PrEP candidacy.

Socio-demographic Characteristics

Participants were asked to report their age (in years), sexual orientation (response options: gay, bisexual, straight, other), whether or not they had been born in France (response options: yes, no), employment status (response options: employed, unemployed, student, retired), and current relationship status (response options: single, relationship with a man, relationship with a woman). The continuous variable of age was categorized into five groups: 18–24, 25–29, 30–39, 40–49, 50 years and older. Due to the small number, responses of “other” for sexual orientation were categorized as missing.

Statistical Analyses

Individuals who self-reported as HIV-positive ($n = 58$) or past or current PrEP use ($n = 51$) were excluded. Descriptive statistics were calculated for socio-demographic characteristics and sexual behaviors, including engagement in group sex, engagement in transactional sex, HIV test history, behavioral indications for PrEP, and perceived candidacy for PrEP. In this study, a modified Poisson regression model [40], a Poisson regression model with a robust error variance, was conducted to examine (1) the association between perceived candidacy for PrEP and behavioral indications for PrEP as well as (2) the relationships among engagement in group sex, engagement in transactional sex, HIV test history, and behavioral indications for PrEP. Adjusted risk ratios (aRR) and 95% confidence intervals (CIs) were calculated. For the outcome of perceived candidacy for PrEP, a multinomial logistic regression was performed, and adjusted relative risk ratios (aRRR) were calculated; the reference was those who responded “definitely not an appropriate candidate”. A sensitivity analysis was conducted to examine if the results are different when drug use during sexual intercourse is excluded as a criterion for PrEP eligibility. The multivariate analyses adjusted for socio-demographic characteristics,

including age, sexual orientation, origin, current employment and relationship status. All statistical analyses were performed using Stata 14.0 (StataCorp, College Station, TX). A two-sided p value < 0.05 was considered statistically significant.

Results

Descriptive statistics are presented in Table 1. The overall sample included 580 responses. Individuals who self-reported as HIV-positive ($n = 58$) or past or current PrEP use ($n = 51$) were excluded. In total, 30.9% of the resulting sample of 471 MSM were aged 30–39, and 82.4% reported their sexual orientation as gay. Additionally, 76.4% reported that they were born in France, and 67.1% reported that they were employed. Only 27.2% reported that they were currently in a relationship with a man. About one-fourth reported engagement in any condomless anal intercourse. Almost two-thirds (62.2%) reported engagement in group sex, 12.7% reported engagement in transactional sex, and 12.1% reported a diagnosis with an STI (syphilis, chlamydia, gonorrhea, or Hepatitis C) within the past 12 months. About half of MSM had used drugs during or before sex, and 77.9% had been tested for HIV in the past 12 months. Moreover, 59.9% had behavioral indications for PrEP, and 19.5% perceived themselves as candidates for PrEP.

Table 2 presents the multivariate associations between perceived candidacy for PrEP and behavioral indications for PrEP. Respondents who considered themselves candidates for PrEP were more likely to meet criteria to be candidates compared to those who did not consider themselves candidates for PrEP (aRR 1.65; 95% CI 1.34–2.03), and a relationship of borderline significance was found between uncertainty in PrEP candidacy and behavioral indications for PrEP.

Table 3 presents the results of the multivariate analysis and associations among risky sexual behaviors (including engagement in group sex, engagement in transactional sex, and HIV test history) and two outcome variables (behavioral indications for PrEP and perceived candidacy for PrEP). Those who had engaged in group sex or transactional sex were more likely to have behavioral indications for PrEP (aRR 1.27; 95% CI 1.07–1.50, aRR 1.32; 95% CI 1.13–1.56, respectively), whereas HIV test history was not significantly associated with behavioral indications for PrEP. Similarly, those who had engaged in group sex or transactional sex were more likely to perceive themselves as eligible for PrEP (aRRR 2.24; 95% CI 1.21–4.16, aRRR 2.58; 95% CI 1.09–6.13, respectively), although those who had never been tested for HIV were less likely to perceive themselves as eligible for PrEP (aRRR 0.18; 95% CI 0.03–0.91).

Table 1 Sample characteristics (n = 471)

| | Total, n (%) |
|--|--------------|
| Overall | 471 (100.0) |
| Age | |
| 18–24 | 76 (16.1) |
| 25–29 | 90 (19.1) |
| 30–39 | 141 (29.9) |
| 40–49 | 105 (22.3) |
| ≥ 50 | 44 (9.3) |
| Sexual orientation | |
| Gay | 388 (82.4) |
| Bisexual | 62 (13.2) |
| Born in France | |
| Yes | 360 (76.4) |
| No | 98 (20.8) |
| Employment status | |
| Employed | 316 (67.1) |
| Unemployed | 65 (13.8) |
| Student | 71 (15.1) |
| Current relationship status | |
| Single | 318 (67.5) |
| Relationship with a man | 128 (27.2) |
| Any condomless anal intercourse | |
| 0 or 1 partners | 354 (75.2) |
| ≥ 2 partners | 105 (22.3) |
| Engagement in group sex ^a | |
| No | 174 (36.9) |
| Yes | 293 (62.2) |
| Engagement in transactional sex | |
| No | 405 (86.0) |
| Yes | 60 (12.7) |
| Any 4 STIs ^b | |
| No | 414 (87.9) |
| Yes | 57 (12.1) |
| Substance use during sexual encounters | |
| No | 230 (48.8) |
| Yes | 228 (48.4) |
| HIV test history | |
| 12 months ago or less | 367 (77.9) |
| More than 12 months ago | 70 (14.9) |
| Never | 24 (5.1) |
| Behavioral indications for PrEP | |
| No | 175 (37.2) |
| Yes | 282 (59.9) |
| Perceived candidacy for PrEP | |
| No, I am definitely not an appropriate candidate | 135 (28.7) |
| I'm not sure who is an appropriate candidate | 232 (49.3) |
| Yes, I am definitely an appropriate candidate | 92 (19.5) |

^aIn the last three months^bAny 4 STIs include gonorrhea, chlamydia, syphilis and Hepatitis C

Discussions

In the setting of an ongoing HIV epidemic among French MSM, the factors that impact PrEP implementation warrant characterization. Here, we used a geosocial-networking smartphone application for MSM to collect survey data from MSM in Paris, France. After removing respondents that indicated past or current PrEP use and HIV positive status, we found that respondents who perceived themselves as eligible for PrEP were more likely than those who did not perceive themselves as eligible to report at least one behavior consistent with an indication for PrEP according to current French guidelines, including engagement in CAI with more than two partners in the last 3 months, an STI diagnosis in the last year, and drug use during sex. In summary, study respondents who perceived themselves as eligible for PrEP were also more likely to meet criteria to be candidates than those who did not. The finding that individuals with HIV acquisition risk behaviors are more likely to self-perceive PrEP candidacy versus individuals without risk behaviors is, to our knowledge, a novel characterization of this population.

Our findings are important given the lack of consensus about the relationship between self-perceptions and objective PrEP eligibility. Some research has shown a discordance between perceived and objective eligibility for PrEP among MSM [27], as well as a lack of awareness of or interest in PrEP in MSM engaging in high-risk behaviors [18, 25, 26, 35]. Other studies have shown that high-risk MSM have significant intent or willingness to use PrEP [20–22, 30, 36], including recent studies in Paris [41]. This variation speaks to the need to characterize community specific understandings of PrEP eligibility, as we have done here, in order to facilitate interventions that advance at risk MSM along the PrEP care continuum. Our findings that individuals who self-perceive PrEP eligibility are more likely to be objective candidates may help clinicians risk-stratify who is more or less likely to engage in care. Additionally, our findings that 60% of our sample were objective candidates and only 20% perceived themselves as such points strongly to the need for additional educational interventions both within and outside of the clinic. Addressing patients who have discordance between self-perceived and guideline-indicated eligibility could include more intensive education, counseling and feedback on behaviors and potential for HIV acquisition.

To further characterize potential means of targeting PrEP interventions, we explored potential associations of risk-related behaviors with perceptions of PrEP eligibility. We found that individuals who are objective candidates for PrEP are more likely to engage in group sex or transactional sex. We believe that the alignment between

Table 2 Multivariable association (aRRs) between perceived PrEP candidacy and PrEP eligibility

| | PrEP eligible (n = 282) | PrEP eligible (excluding substance use during sex) (n = 136) |
|---|----------------------------|--|
| | aRR (95% CI) | aRR (95% CI) |
| Perceived candidacy for PrEP | | |
| Yes, I am definitely an appropriate candidate | 1.65 (1.34, 2.03)** | 3.76 (2.42, 5.85)** |
| I am not sure | 1.23 (1.00, 1.52) | 1.71 (1.08, 2.71)* |
| I am definitely not | Referent | Referent |

Adjusted for age, sexual orientation, origin, current employment and relationship status

aRR adjusted risk ratio, aRRR adjusted relative risk ratio, CI confidence interval

*p < 0.05, **p < 0.01

Table 3 Multivariable associations between sex behaviors, PrEP indication and PrEP perceived candidacy

| | PrEP eligible ^a | PrEP eligible (excluding substance use during sex) | Perceived candidacy for PrEP ^b | |
|---------------------------------|----------------------------|--|---|-------------------|
| | aRR (95% CI) | aRR (95% CI) | aRRR (95% CI) | aRRR (95% CI) |
| Engagement in Group sex | 1.27 (1.07, 1.50)** | 1.50 (1.07, 2.10)* | 2.24 (1.21, 4.16)* | 1.33 (0.84, 2.12) |
| Engagement in Transactional Sex | 1.32 (1.13, 1.56)** | 1.58 (1.11, 2.25)* | 2.58 (1.09, 6.13)* | 1.70 (0.79, 3.67) |
| HIV test history | | | | |
| 12 months ago or less | Referent | Referent | Referent | Referent |
| More than 12 months ago | 0.95 (0.77, 1.18) | 0.49 (0.28, 0.85)* | 0.64 (0.28, 1.48) | 1.09 (0.59, 2.01) |
| Never | 0.69 (0.42, 1.13) | 0.44 (0.15, 1.29) | 0.18 (0.03, 0.91)* | 0.46 (0.17, 1.28) |

Adjusted for age, sexual orientation, origin, current employment and relationship status

aRR adjusted risk ratio, aRRR adjusted relative risk ratio, CI Confidence Interval

^aModified Poisson regression model

^bMultinomial logistic regression model where perceived candidacy for PrEP is the outcome (reference category: those who responded “definitely not an appropriate candidate”)

*p < 0.05; **p < 0.01

associations between group and transactional sex with both self-perceived and objective candidacy is a further novel characterization of this population. These findings characterize an optimal population for PrEP uptake, meaning they engage in high-risk behaviors, perceive of themselves as eligible for PrEP, and report no prior PrEP use. Other research has found that risk engagement can vary with venue [42], and in light of our findings, we believe that venues that host group or transactional sex may be effective sites to target interventions to increase awareness and motivation to initiate PrEP. These findings support the inclusion of engagement in group and transactional sex in PrEP candidacy screening, especially in the context of research that shows the percentage of “optimal” PrEP candidates (i.e. willing and high-risk) can vary when the threshold for “high-risk” is shifted [16]. Efforts should be made to target interventions to increase PrEP uptake and adherence to those engaging in group or transactional sex in this population.

Clinical engagement, especially HIV testing, is associated with PrEP awareness and interest [21, 23, 29–31, 33, 36, 43]. In addition, individuals who do not perceive themselves to be at risk for HIV may not seek HIV testing services [44]. We found that those who had never been tested for HIV were less likely to perceive themselves as eligible for PrEP. This is consistent with previous studies that have shown associations between PrEP awareness and various types of clinical engagement, such as having a primary care provider or accessing HIV/STI testing [21, 23, 29–31, 33, 36, 43]. These findings affirm the importance of utilizing HIV testing services and clinical encounters to screen for PrEP candidacy and provide appropriate patient education about PrEP. Additionally, these findings suggest the utility of increasing HIV/STI testing access and, alternatively, targeting interventions beyond clinical spaces. Clinical encounters are a critical space for PrEP outreach and implementation, and our findings suggest the possibility of clinical and HIV testing services engagement as a tool for PrEP outreach in

the population of this study. The direct impact of HIV testing on PrEP awareness is out of the scope of our survey results, but future research in this area is warranted by our findings.

Limited PrEP engagement has been attributed to shortcomings in awareness and motivation [14, 17], disparities between subjective and objective risk [16], and long-term concerns around cost, side effects, access, and stigma [24, 28, 45–47]. Thus, the most effective interventions to increase uptake will address all aspects of the PrEP care continuum, from awareness to adherence. Our findings and the associations they elucidate are critical to creating relevant and targeted interventions to increase PrEP uptake and adherence.

Our findings are not without limitations. These findings were derived from data collected from a convenience sample of MSM in a single Western European metropolitan area from a single geosocial-networking smartphone application for MSM. Therefore, these findings may not be applicable to MSM outside of Western Europe or France, or MSM who do not use either geosocial-networking smartphone applications or this specific application. Recruiting from an application of this type may also bias the sample to including MSM with a greater number of partners, as emerging research has suggested that MSM who use geosocial-networking smartphone applications to meet sexual partners have higher numbers of sexual partners [48]. Recent research, however, has suggested that MSM who use apps are no more likely to engage in condomless sex [49]. Participation in a social network of this type may also facilitate PrEP awareness, as these smartphone applications are often common platforms for public health campaigns and this can further bias the sample to over-estimate awareness of PrEP [50, 51]. The levels of awareness found in this sample, however, are consistent with other samples of MSM recruited from geosocial-networking smartphone applications in other metropolitan centers [46, 52].

While consistent for similar high-risk behaviors, the indications for PrEP vary slightly between those in France by the National Agency for Safety of Medications and Health Products [5] and those put forth by the US Center for Disease Control and Prevention [53]. This further complicates our ability to generalize these findings about perceived and objective candidacy and candidacy-associated risk behaviors outside of the population studied here. Our survey was designed to capture a range of sexual behaviors and characteristics in this population, and in an attempt to avoid survey fatigue we did not assess PEP use in the last 12 months. We also did not ask about Hepatitis B as an acquired STI, given its low prevalence among French MSM. While PrEP guideline indications include CAI over the last 6 months [5], our survey only asked about CAI in the last 3 months, which is consistent with PrEP efficacy trials. Regarding number of partners, MSM would be eligible for PrEP by reporting CAI with more than two partners in the past 6 months, we only assessed the last 3 months.

Therefore, we may be collectively under-estimating the number of individuals with at least one behavior indication for PrEP based on the lack of available data on these criteria.

Our findings are an important characterization of a population for whom PrEP is efficacious and further interventions are required for increased uptake and adherence. The nature of our survey questions, however, did not probe about the differences between awareness, intent to use PrEP, and concerns related to use. Further research will be critical to further elucidate what factors contravene uptake and adherence of PrEP among French MSM [14, 17]. Furthermore, future research is needed to address the general discrepancy between objective candidacy (59.9%) and self-perception of candidacy (19.5%) in context of our conclusion that objective candidate for PrEP were more likely to self-perceive candidacy raises questions for future research outside the scope of our survey.

We report here a discrepancy between perceived and objective candidacy for PrEP, noting that self-perceived candidates are more likely to be objective candidates, in a sample of French MSM recruited from a popular geosocial-networking smartphone application. We also found that respondents engaging in group or transactional sex, as well as having an HIV test in the last year, were likely to be both objective and self-perceived candidates. These findings improve the ability to create targeted interventions to increase PrEP implementation in a population where HIV remains at epidemic levels. Further research should aim to elucidate nuances in awareness, intent, and uptake as well as challenges to sustained PrEP implementation.

Acknowledgements We thank the translators and participants of this study who contributed to the project.

Funding Dr. Dustin Duncan was funded in part by National Institutes of Health Grants R01MH112406, R21MH110190, and R03DA039748 and the Centers for Disease Control and Prevention Grant U01PS005122.

Compliance with Ethical Standards

Conflict of interest All authors declare no conflicts of interest.

Ethical Approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

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

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