Published in final edited form as:

AIDS Educ Prev. 2016 October ; 28(5): 378–392. doi:10.1521/aeap.2016.28.5.378.

Using online settings to identify gay and bisexual men willing to take or with experience taking PrEP: Implications for researchers and providers

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Abstract

Given the ongoing HIV epidemic, it is essential to identify gay and bisexual men who are interested in starting PrEP as well as active PrEP users. We report on online survey data gathered over a 17-month period in 2014–2015 from gay and bisexual men identified via six sources of recruitment ($n = 2903$): Facebook, a hookup website, two geosocial-sexual networking apps (herein “App 1 – Pop up ads” and “App 2 – Banner ads”), and two types of listservs (one focused on general gay nightlife, and one focused on gay sex parties). Willingness to take PrEP were as follows: sex party listservs (71.3%), both Apps (69.8%), Facebook (67.6%), hookup website (65.2%), and nightlife listservs (50.5%). Experience having taken PrEP was as follows: sex party listservs (23.4%), App 2 – Banner ads (22.5%), nightlife listservs (17.1) Facebook (14.2%), App 1 – Pop-up ads (12.4%), and hookup website (2.1%). In multivariable modeling, willingness to go on PrEP was independently associated with being younger, single, a person of color, and having been tested for HIV in the last 12 months. Source of recruitment was largely unassociated with willingness to start PrEP. Number of recent male partners, number of recent condomless anal sex (CAS) events, and when data were collected (i.e., time in months) were not significantly associated with willingness to start PrEP. In multivariable models, experience having taken PrEP was positively associated with sexual identity as gay, number of recent male sex partners, number of recent CAS acts, being tested for HIV in the last 12 months, and time (in months). Experience taking PrEP varied greatly by recruitment source, suggesting both researchers and providers might

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Conflicts of interest: The authors declare that they have no conflict of interest.

Research involving human subjects: 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.

be well served to utilize digital mediums to effectively identify these individuals; however, should do so with caution as not all digital options may prove fruitful.

Keywords

Pre-Exposure Prophylaxis (PrEP); men who have sex with men; gay and bisexual men; internet

INTRODUCTION

Gay and bisexual men (GBM) as well as other men who have sex with men (MSM) continue to be most affected by the HIV epidemic in the U.S., and recent estimates on the proportion of gay, bisexual, and MSM who will be diagnosed with HIV in their lifetimes—should current trends continue—are alarming (CDC, 2016). In 2016, the CDC estimated that one in six MSM will be diagnosed with HIV in their lifetime, including one in two Black MSM, one in four Latino MSM, and one in eleven White MSM (CDC, 2016). Until recently, behavioral risk reduction strategies (e.g., condom use, partner reduction, serosorting) were among the only available options to reduce HIV incidence. However, in 2012, U.S. Food and Drug Administration approved the use of once-daily Truvada (Emtricitabine/Tenofovir) as biomedical Pre-Exposure Prophylaxis in the prevention of HIV among HIV-negative adults. Given the ongoing burden of HIV among MSM, the World Health Organization (WHO) has recommended that *all* MSM men consider PrEP as part of their comprehensive HIV prevention plans (WHO, 2015). Meanwhile, the CDC determined that as many as one in four MSM would be appropriate candidates for PrEP (CDC, 2015).

Although it has been more than four years since PrEP's approval and in spite of consistent data showing its efficacy in preventing HIV when taken as prescribed, the uptake among those who would benefit from PrEP has been slow (Eaton, Driffin, Bauermeister, Smith, & Conway-Washington, 2015; Peabody, 2016). Knowledge and familiarity of PrEP among gay, bisexual, and GBM is increasing, but far fewer are currently using PrEP (Parsons, Rendina, Whitfield, & Grov, 2016; Peabody, 2016). A New York City (NYC) study found that knowledge of PrEP had increased significantly between 2011 and 2014, though willingness to start PrEP did not (Grov, Rendina, Whitfield, Ventuneac, & Parsons, 2016). Nevertheless, some data suggest that uptake may be gaining momentum—the number of New York State Medicaid beneficiaries receiving PrEP increased from 303 in 2013–2014 to 1330 in 2014–2015 (a 438% increase) (CDC, 2015; Poz.com, 2016). In addition, annual surveys of MSM in NYC found the proportion of the participants who said they were on PrEP increased from 2.1% in 2013, to 3.2% in 2014, and 14.8% in 2015 (Poz.com, 2016). However, these numbers still fall far below the CDC suggestion that one in four MSM should be on PrEP (CDC, 2015).

For researchers and providers, it is becoming increasingly essential to identify GBM who are interested in starting PrEP, and thus linking them to services, as well as identifying active PrEP users. Furthermore, it is important to monitor trends in PrEP adoption over time. Over the past few decades, the internet has become a venue not only for gay and bisexual men to interact with each other, but also for researchers and providers to engage with key

populations,(Grov, Breslow, Newcomb, Rosenberger, & Bauermeister, 2014) including those who would benefit from PrEP. However, the internet has undergone major transitions with the uptake of mobile devices, the expansion of social networking websites like Facebook, and growth of the app marketplace including the use of geosocial-sexual networking apps. As a result, there are many digital avenues in which researchers and providers can interact with gay and bisexual men. In this study, we report on online survey data gathered from gay and bisexual men identified via six digital avenues: Facebook, a hookup website, two geosocial-sexual networking apps, and two types of listservs (nightlife listserv, sex party listserv). Data were gathered over a 17-month period in 2014–2015 as part of ongoing efforts to identify and enroll participants in research studies. The goal of this manuscript was to identify factors associated with interest in starting PrEP as well as those associated with having taken PrEP (either current or former use). Our focus was both on evaluating differences across venues as well as changes over 17-month period of time in which data were collected. Researchers and providers seeking to engage gay and bisexual men interested in starting PrEP, as well as those with experience taking PrEP, can use the findings from this study.

METHOD

Participants and Procedures

Data for this study were gathered as part of ongoing efforts to screen and enroll potential participants into one of several research studies that were being conducted by the research team. The recruitment period spanned August 1, 2014 through December 13, 2015, during which time multiple online avenues were utilized to advertise for paid research studies with GBM. These included banner ads on a popular cost-free, profile-based, men-for-men online sexual networking website (herein called “hookup website”), Facebook, two types of email listservs targeted at gay and bisexual men (New York City nightlife, and New York City sex parties), pop up messages on a popular men-for-men geosocial sexual networking mobile app (herein called “App 1 – Pop-up ads”), and a banner ad on a second popular men-for-men geosocial sexual networking mobile app (herein called “App 2 – Banner ads”). Potential participants who clicked any one of our ads were directed to a secure survey in a separate browser window. The first page of the survey contained the informed consent. The informed consent indicated the survey they were taking had no incentive, but the survey would screen them for other studies for which they could be compensated if they joined. The survey took approximately 10 minutes to complete.

Subsequently joining a paid research study would require the participants to present in-person at our research office in NYC. As a result, advertising was geo-targeted toward men in the NYC area with the exception of the hookup website, which targeted men across the U.S. And, with the exception of Facebook, advertising was open to all ages—Facebook ads were targeted to those aged 18–29.

To be eligible to complete the survey, participants had to provide consent, be over the age of 18, assigned male sex at birth, and currently identify as male. To be eligible for the present analyses, participants had to additionally indicate they lived in the NYC area or visited at least weekly. Self-reported HIV-seropositivity was highest among men surveyed via the

hookup website (33.3%) and lowest among participants surveyed via sex party listservs (11.3%). Others were as follows, Facebook (23.0%), App 2 – Banner ads (21.0%), nightlife listservs (17.4%), and App 1 – Pop-up ads (14.6%). HIV-positive men were not asked questions about PrEP and thus excluded from further analyses. Procedures were approved by the City University of New York Institutional Review Board.

In total, 18,588 individuals clicked the link/banner taking them to the initial consent page, the majority of whom ($n=10,192$) were directed via the hookup website, followed by Facebook ($n=3726$), App 2 – Banner ads ($n=1882$), nightlife listservs ($n=1661$), App 1 – Pop-up ads ($n=755$), and sex party listservs ($n=432$). We do not have data on impressions (i.e., the number of times a given ad might have been viewed). Passing the first page of the survey (i.e., consent) varied widely with the hookup website having the lowest (25.5%) and App 1 – Pop-up ads having the highest (99.2%). Facebook (66.7%), sex party listservs (66.9%), and nightlife listservs (62.8%) had roughly similar consent rates, and App 2 – Banner ads had a 48.1% click to consent. With regard to meeting eligibility criteria for inclusion in the present analyses (previously outlined), 141 participants were from the hookup website, 1519 via Facebook, 625 via nightlife listservs, 222 via sex party listservs, 679 via App 1 – Pop-up ads, and 687 via App 2 – Banner ads. Unlike other recruitment avenues, ads on the hookup website were not geo-located for those living in NYC. Thus, please note that the much of the reduction in participants from the hookup website for the present analyses was due to participants not living the NYC area (76.0% of those who consented and were otherwise eligible were excluded from the present analyses due to not living in NYC).

Figure 1 depicts recruitment over time by venue among participants who met the eligibility criteria previously outlined. On the hookup website, our banner ad was displayed for a 30 day period in August 2014. On Facebook, ads were displayed as boosted Facebook posts on a twice-monthly basis for the entire recruitment period. For nightlife listservs, ads were sent out in September and November 2014 as well as January and March 2015. For sex party listservs, ads were sent out in October 2014 and September 2015. For App 1, pop-up messages were spread out twice a week for 5 weeks in February and March 2015. Finally, for App 2, a banner ad was in rotation with other ads for the duration of the recruitment period. Our sample included 3100 HIV-negative and unknown status participants, for whom—due to a programming error—we have PrEP data on 2903 (93.6%).

Measures

Participants indicated their age in years, race and ethnicity, sexual identity, if they were currently in a committed relationship (1 = yes, 0 = no), whether they had health insurance (1 = yes, 0 = no), the number of male sex partners in the last 90 days, and the number of condomless anal sex (CAS) acts with male partners in the prior 90 days. Participants indicated how recently they had received an HIV test (in the last 3 months, 4 to 6 months ago, 7 to 12 months ago, greater than 12 months, or never tested). For analytic purposes (i.e., to reduce used degrees of freedom), men who said they had never tested ($n=115$, 3.8%) were combined with men having tested greater than a year ago ($n=413$, 13.6%).

Participants were presented with the following information about PrEP:

“PrEP (Pre-Exposure Prophylaxis) is a new biochemical strategy to prevent HIV infection. PrEP involves HIV-negative guys taking anti-HIV medications (for example, Truvada) once a day, every day to reduce the likelihood of HIV infection if they were exposed to the virus. Clinical trials of PrEP indicated that it reduced the likelihood of HIV infection when used in combination with other preventative methods, such as condoms.”

Participants were then asked if they had ever been prescribed HIV medication as PrEP (1 = yes, 0 = no). Those who had never taken PrEP were asked, “*Suppose that PrEP is at least 90% effective in preventing HIV when taken daily. How likely would you be to take PrEP if it were available for free?*” (1 = definitely take it, 2 = probably take it, 3 = might take it, 4 = probably not take it, 5 = definitely not take it). This variable was dichotomized such that participants who said they would definitely or probably take it were coded as being willing to take PrEP (1 = yes, 0 = no).

Analysis Plan

We used chi-square, ANOVA, and Kruskal-Wallis tests (as appropriate) to compare characteristics of participants based upon the source from which they were referred to the survey. For instances in which an omnibus test was significant, post-hoc analyses were performed with a Bonferroni correction. Next, using logistic regression, we computed adjusted odds ratios associated with high willingness to take PrEP. Finally, also using logistic regression, we computed adjusted odds ratios associated with having current or past experience taking PrEP. Variables entered into both models included age, relationship status, race, sexual identity as gay, number of male partners in the past 90 days, number of CAS acts with male partners in the past 90 days, whether or not the participant had an HIV test in the prior 12 months, venue of recruitment, and a variable for time of survey completion in months (0 = August 2014 through 16 = December 2015). Given our focus on determining differences by venue in which participants were surveyed, we calculated the marginal probabilities within each venue based on the models for high PrEP acceptability and experience taking PrEP. We further compared the marginal probabilities in each group using post-hoc tests adjusted with LSD correction for multiple comparisons.

RESULTS

Table 1 reports on demographic and behavioral differences between men recruited via the six recruitment sources. Significant differences were observed for all analyses. On average, participants from Facebook were the youngest ($M = 26.4$)—an artifact of our Facebook ads being limited to those aged 18–29—and participants from the hookup website were the oldest ($M = 37.1$). Overall, there was high racial and ethnic diversity across recruitment source; however, participants from Facebook were the most diverse (61.3% men of color) and participants from nightlife listservs were the least (35.5% men of color). Men from nightlife listservs (94.2%) were the most likely to identify as gay and men from the hookup website (69.1%) were the least. The majority of participants indicated they had health insurance and this was highest (87%) among men from nightlife listservs, sex party listservs, and App 2 – Banner ads; whereas, only 77.3% of men from App 1 – Pop-up ads indicated they had health insurance. Across recruitment source, more than half of the participants

reported having received an HIV test within the last 6 months; however having been tested greater than 12 months ago or never was highest among men recruited via the hookup website (30.9%) and lowest among men recruited via sex party listservs (10.2%).

With regard to sexual behavior, median number of male sex partners in the prior 90 days was highest among recruited via App 2 – Banner ads (Mdn = 9) and sex party listservs (Mdn = 8) and lowest among men recruited via Facebook (Mdn = 3) and nightlife listservs (Mdn = 4). The median number of CAS acts with male partners in the prior 90 days was highest among participants recruited via the hookup website (Mdn = 3.5) and lowest among men recruited via App 1 – Pop-up ads (Mdn = 1). Prior or current PrEP treatment was highest among men recruited via sex party listserv (23.4%) and App 2 – Banner ads (22.5%) and lowest among men recruited via the hookup website (2.1%). And among men who were not currently taking PrEP and/or had no prior experience taking PrEP, indicating that one would probably or definitely take PrEP was overall high; however, highest among participants recruited via sex party listservs (71.3%) geosocial networking apps (both were 69.8%). It was lowest among men recruited via nightlife listservs (50.5%).

Table 2 reports the results of a logistic regression to assess factors associated with willingness to take PrEP among PrEP naïve men. In this model, younger age, being single, being a person of color, and having tested for HIV in the last 12 months were associated with higher odds of being willing to take PrEP. Men from the nightlife listserv had significantly lower odds than men surveyed via all other avenues of being willing to take PrEP (see Figure 2). Number of recent male partners, number of recent CAS events with male partners, sexual identity, and month of recruitment were not associated with willingness to take PrEP.

Table 3 shows the results of a logistic regression to identify factors associated with having been prescribed PrEP either currently or formerly. Being gay-identified, having a greater number of male sex partners in the prior 90 days, having a greater number of CAS acts in the past 90 days, having received an HIV test in the last 12 months, and being recruited later in time were associated with greater odds of having taken PrEP. Age, relationship status, and race were not. Unlike in the previous analyses, there were numerous venue-by-venue differences in current/prior experience taking PrEP. These differences are depicted plot of predicted probabilities (using LSD correction). For both regression, we checked for multicollinearity and this was not a factor of concern for analyses. See Figure 3.

DISCUSSION

We explored demographic and behavioral differences among sexually active NYC gay and bisexual men surveyed via various online recruitment methods with an emphasis on determining differences in willingness to go on PrEP and in prior experience having taken PrEP based on recruitment venue. Venue was largely unassociated with willingness to start PrEP (which was high overall); however, there were numerous venue differences in whether men had experience taking PrEP. Our findings suggest that both researchers and providers might be well served to utilize digital mediums to identify effectively men interested in starting PrEP as well as those who have taken PrEP; however, some caution would be

needed as not all digital options may prove fruitful, particularly with regard to identifying men who have used PrEP.

We also explored characteristics associated with interest in PrEP as well as experience taking PrEP. In multivariable modeling, several characteristics were independently associated with high willingness to go on PrEP: younger age, being a person of color, being single and having been tested for HIV in the last 12 months. These findings align well with regard to PrEP treatment guidelines for the highest priority populations (CDC, 2014; WHO, 2014), and additionally suggest that discussing PrEP with patients during routine HIV testing might be an effective means to engage men into PrEP treatment. Further, although venue in which participants were surveyed was associated with demographic and behavioral characteristics, it was largely unassociated with whether men would consider starting PrEP. Thus, our findings suggest providers and researchers should find equal interest in PrEP when engaging men in these types of venues, and can instead target venues based on desired demographic and behavioral characteristics inherent to the populations found via these venues.

In contrast, number of recent male partners, number of recent CAS events, and time were not independently associated with willingness to start PrEP. Though not consistently, (Eaton et al., 2014) researchers have found a positive association between a prior history of behaviors that would increase HIV acquisition risk and willingness to start PrEP (i.e., men who would be high priority candidates for PrEP based on their pre-existing behavior are more willing than others to start PrEP) (Gamarel & Golub, 2014; Golub, 2014; Grov, Rendina, et al., 2016; Grov, Whitfield, Rendina, Ventuneac, & Parsons, 2015; Parsons et al., 2016). Whereas, in our study, it could be that men who objectively would be high priority candidates for PrEP do not perceive themselves as appropriate for PrEP, or perceived that PrEP was appropriate for someone whose HIV acquisition risk was higher than theirs. This would be similar to Gallagher et al. (2014) who surveyed 629 MSM at commercial sex venues in NYC and found 80.3% met admission criteria for the iPrEX trial (i.e., would be appropriate candidates for PrEP); however, most of these men (78.0%) did not perceive their own HIV risk to be significant enough to warrant PrEP use.

Meanwhile, our findings with regard to no significant changes in willingness to start PrEP over time mirror that of another study whereby knowledge of PrEP increased significantly between 2011 and 2014; however, willingness to start PrEP did not (Grov, Rendina, et al., 2016; Grov et al., 2015). This is in spite of both increasing public attention (e.g., social media campaigns) combined with community-based prevention campaigns regarding the effectiveness of PrEP. Although we did not collect data on PrEP stigma in the present study, we wonder the extent to which stagnant willingness to start PrEP is a combined result of providers' unwillingness to recommend PrEP to their patients (i.e., the Purview Paradox) (Krakower, Ware, Mitty, Maloney, & Mayer, 2014), lack of provider awareness of PrEP (the CDC estimates one-third of primary care providers are unfamiliar with PrEP) (CDC, 2015), and prominent anti-PrEP advertising campaigns in popular gay media such as those by the AIDS Healthcare Foundation (Heywood, 2014; Mandell, 2016; O'Neill, 2014).

Overall, 16% of the men indicated they had previously taken or were currently taking PrEP; however, this varied greatly by recruitment source and was highest among men surveyed via sex party listservs (23.4%) and App 2 – Banner ads (22.5%), and lowest among men surveyed via the hookup website (2.1%). This suggests both researchers (who are seeking to study men who have or are taking PrEP) and providers (seeking to further engage men with PrEP experience) might be well served to utilize digital mediums to identify these individuals; however, should do so with caution as not all options may be effective sources. Meanwhile, our findings also suggest the need for continued monitoring of PrEP uptake across samples surveyed via different venues, particularly because experience taking PrEP increased significantly over time.

In multivariable models, experience having taken PrEP was associated significantly with sexual identity as gay, number of recent male sex partners, number of recent CAS acts, being tested for HIV in the last 12 months (which may be an artifact of the fact that frequent HIV testing is necessary for continued PrEP treatment), and time. Although experience taking PrEP was associated with behaviors that could put men at risk for STI acquisition/transmission, it is beyond the scope of this study to hypothesize whether men who were more prone to these behaviors sought out PrEP treatment or if PrEP treatment resulted in reduced condom use (or increased sex partners). As has been suggested (Grover, Rendina, et al., 2016), it may be that pre-existing patterns of sexual behavior are the primary determinant of CAS while on PrEP.

Our finding that PrEP was associated with time corresponds with data suggesting that the number of individuals going on PrEP has increased (CDC, 2015; Poz.com, 2016). These changes are perhaps in part a result of widespread community-based media/educational campaigns (e.g., PrEPforsex.org; whatisPrep.org), grassroots social media campaigns, and word-of-mouth among gay and bisexual men, combined with the passage of state and federal programs to facilitate access to PrEP among high priority populations (New York State Department of Health and Mental Hygiene, 2014).

Limitations

The outcomes of our study should be understood in light of its limitations. The quantitative survey allowed us to gather data across a wide range of variables; however, questions were limited in the interest of brevity and responses were closed-ended. This is in-part by design as the survey from which data were taken is being used as a screening tool to enroll participants in research studies in which additional data would later be collected. Although data collection occurred over time, participants completed a cross-sectional survey. Thus, with the exception of time, we cannot determine causality between variables. Recruitment did not occur over identical time periods across all venues, and this may be associated with some of the venue differences observed in experience taking PrEP; however, we note that multivariable analyses controlled for date of survey completion. The roll out of PrEP has scaled up since being approved by the FDA in 2012; however, our survey did not collect data on exposure to PrEP advertising campaigns or other sources in which a person may have heard of PrEP (e.g., health care provider, friends).

With regard to willingness to start PrEP, we used a hypothetical scenario in which participants were told PrEP was at least 90% effective when taken daily and available for free. Data from PrEP demonstration projects has indeed confirmed exceptionally high efficacy when taken daily,¹¹ and it is possible for those with insurance to get PrEP at low or no cost. That being said, our scenario did not describe additional nuances required of someone to start PrEP such as finding a medical provider, talking about sexual behavior/health with a provider, undergoing routine HIV and STI testing, and obtaining an insurance plan that will cover medical visits as well as the PrEP prescription. Nor did the survey collect data on such factors, including barriers to PrEP adoption.

Further, we recognized the inherent discord between intentions and ultimate behavior—while likely correlated, not all individuals who intend to engage in a behavior may ultimately do so. Our dependent variables were both on 5-point scales, but due to their non-normal distribution were truncated for analyses. Logistic regression is a robust and commonly used method of analysis; however, we recognize that other analysis methods such as OLS regression—were the data to permit them—could provide different nuance on our findings. Our findings were based on online samples of men in NYC, thus limiting generalizability. Our measure of PrEP use was unable to differentiate current from previous (but not current) PrEP use. The consent rate for our study varied greatly by recruitment source and this deserves further consideration as we do not have data on those who declined to participate. It is noteworthy, however, that our response rates were within the ranges reported by many online studies of gay and bisexual men (Grov, Cain, et al., 2016).

Online surveys can enhance anonymity and thus decrease social desirability; however, responses were self-reported. And, although there was no incentive to participate in this online study, our survey's aim was to recruit/screen for other incentivized research studies, and this might have motivated individuals to complete the survey more than once. We believe, however, that serial/malicious responses were rare. In order to be paid for a larger study, one would have to present for a face-to-face assessment in which their eligibility would be verified and participant contact information would be recorded. Although a tech savvy individual can reset his IP address (Bauermeister et al., 2012; Grey et al., 2015; Konstan, Simon, Ross, Stanton, & Edwards, 2005; Teitcher et al., 2015), we recorded no duplicate IP addresses. That being said, it is possible that a given individual might have been recruited via multiple methods and across multiple devices (e.g., completed the survey via his smart phone when he saw the pop up message on app 1, and happened to be a member of the nightlife listserv and completed that survey from his home computer). Our study is limited in that we do not know the extent in which a given participant might have completed the survey via our different recruitment methods; however, given the magnitude of the observed demographic and behavioral differences identified across recruitment source, we believe there was more than sufficient independence between samples.

Conclusion

We surveyed gay and bisexual men identified via a variety of online methods, finding many demographic and behavioral differences across samples. However, with the exception of men recruited via nightlife listservs, venue in which participants were identified was not

significantly associated with willingness to start PrEP—which was high overall. Although the number of individuals who had current/previous experience taking PrEP increased over time, willingness to start PrEP did not change over the 17-month period in which participants were screened. For men who would be appropriate candidates for PrEP, our findings highlight the need to bridge willingness and intentions to start PrEP with actual PrEP uptake and adherence (Kelley et al., 2015). We found no association between recent CAS and willingness to start PrEP; however, men with experience taking PrEP were more likely than others to report recent CAS and a greater number of recent male sex partners—but this may be an artifact of sexual behavior patterns that preceded PrEP use (Grov, Rendina, et al., 2016). One out of every six men indicated they had experience taking PrEP—short of the CDC recommendation that as many as one out of every four gay and bisexual men might be appropriate candidates for PrEP (CDC, 2015)—but this value does closely align with a 2015 survey of NYC MSM finding 14.8% were using PrEP (Poz.com, 2016). This highlights the continued need to scale up PrEP uptake. Online screening may be an effective method for finding men who have experience taking PrEP; however, targeted recruitment may be necessary as rates varied widely based on where men were identified.

Acknowledgments

Data for this study were gathered in concert with online recruitment efforts to identify and screen potential participants to enroll in one of the following studies conducted at the Hunter College Center for HIV/AIDS Educational Studies and Training (CHEST): Express Yourself (R03DA033868 – Brooke Wells, Principal Investigator), Keep it Up (R01 DA035145– Brian Mustanski, Principal Investigator), WISE (R01 DA029567 – Jeffrey T. Parsons, Principal Investigator), and PrEP & Me (R21 DA039019 – Christian Grov, Principal Investigator). H. Jonathon Rendina was supported by a career development award from the National Institute on Drug Abuse (K01-DA039030). The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health. The authors would like to thank other members of the CHEST Team: Chris Murphy, Ana Ventuneac, Demetria Cain, Carlos Ponton, Sitaji Gurung, Mark Pawson, Chris Hietikko, and Tyrel Starks.

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	Total	HIV status (%)		2014					2015																
	<i>n</i>	Negative	Unknown	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.					
Hookup website	94	78.7	21.3
Facebook	1170	87.5	12.5																						
Nightlife listserv	516	94.0	6.0
Sex party listserv	197	91.9	8.1
App 1 - Pop-up ads	580	86.4	13.6
App 2 - Banner ads	543	88.4	11.6																						
Total <i>n</i>	3100	88.5	11.5	367	208	169	143	103	155	474	165	121	107	157	104	223	124	99	317	64					

Figure 1.

Survey completion among eligible participants by recruitment source over time

Figure 2.

Venue differences in the estimated probability of willingness to take PrEP

Note: Participants from Nightlife listservs had significantly lower odds than other groups of expressing willingness to take PrEP. Other groups did not significantly differ from each other

Figure 3.

Venue differences in the estimated probability for having taken PrEP

Note: Groups significantly differed: A B, C, D, E, F; B C, D, F; C E; D E; E F

Table 1

Demographic and behavioral differences across six recruitment venues, HIV-negative and HIV-unknown men, $n = 2903$

	Group A Hookup website		Group B Facebook		Group C Nightlife listserv		Group D Sex party listserv		Group E App 1 - Pop- up ads		Group F App 2 - Banner ads		χ^2 or F or $K-W$		p		Post hoc
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%					
Age (<i>M, SD</i>), ANOVA	37.1	12.1	26.4	6.6	33.0	9.3	28.7	6.5	30.6	8.9	33.9	10.2	93.4	<.001			C = F; D = E
Currently in a relationship, Chi-Square	46	48.9	596	50.9	274	53.1	57	28.9	140	24.1	159	29.3	192.3	<.001			A = B = C; D = E = F
Race and ethnicity, Chi-Square																	
White	53	56.4	453	38.7	333	64.5	120	60.9	216	37.2	371	58.4	213.7	<.001			D = A, C, F
Black	20	21.3	271	23.2	54	10.5	23	11.7	102	17.6	50	9.2					
Latino	14	14.9	338	28.9	90	17.4	28	14.2	172	29.7	109	20.1					
Other/Multiracial	7	7.4	107	9.2	39	7.6	26	13.2	90	15.5	67	12.3					
Self-identified as gay, Chi-Square	65	69.1	102	87.9	486	94.2	175	88.8	507	87.4	477	87.8	51.6	<.001			B = D, E, F; D = C, E, F; E = F
Has health insurance, Chi-Square	80	85.1	654	82.4	154	87.0	80	87.0	437	77.3	232	86.9	17.9	0.003			E C, F
When was last HIV test? Valid $n = 3040$, Chi-Square																	
3 months ago or fewer	30	31.9	474	41.3	217	44.2	98	49.7	242	41.8	256	48.2	49.4	<.001			A = B, C, E; B = C, D, F; C = D, F;
4 to 6 months	21	22.3	266	23.2	103	21.0	49	24.9	176	30.4	118	22.2					D = E = F
7 to 12 months	14	14.9	185	16.1	86	17.5	30	15.2	79	13.6	68	12.8					
Greater than 12 months, or never tested	29	30.9	223	19.4	85	17.3	20	10.2	82	14.2	89	16.8					
Male partners in the past 90 days (Mdn, IQR), Kruskal-Wallis	6	3-14.25	3	1-6	4	1-10	8	5-15	6	3-10	9	5-18	393.9	<.001			A = E, F; D = F
CAS acts in the past 90 days (Mdn, IQR), Kruskal-Wallis	3.5	0-20	2	1-7	2	1-10	2	1-5.75	1	0-5	2	1-7	43.5	<.001			A, B, C, D, F E
Current or previous experience being on PrEP, valid $n = 2902$, Chi-Square	2	2.1	163	14.2	65	17.1	46	23.4	72	12.4	113	22.5	46.1	<.001			B = C, E; C = D, E, F; D = F
Probably or definitely take PrEP if at least 90% effective, valid $n = 2404$, Chi-Square	60	65.2	659	67.6	159	50.5	107	71.3	354	69.8	269	69.8	42.8	<.001			C D, E, F

Mdn: Median, IQR: Interquartile Range

= Groups are not significantly different, Groups are significantly different (using Bonferroni correction, $p = 0.05/14$, $p < 0.0036$)

Table 2Logistic regression predicting high willingness to take PrEP, $n = 2903$

	AOR	95% CI	<i>p</i>
Age (in years)	0.98	0.97 -- 0.99	0.003
In a relationship, 1 = yes	0.62	0.51 -- 0.75	< .001
Participant is White, 1 = yes	0.75	0.62 -- 0.90	0.002
Sexual identity as gay, 1 = yes	1.14	0.87 -- 1.50	0.34
Number of male partners in the past 90 days	1.00	0.99 -- 1.00	0.28
Number of CAS acts in the past 90 days	1.00	1.00 -- 1.00	0.65
HIV test in the last 12 months, 1 = yes	1.29	1.04 -- 1.61	0.02
Month of enrollment (0 = Aug. 2014, 16 = Dec. 2015)	1.00	0.98 -- 1.03	0.83
Venue of recruitment			
Hookup website	2.07	1.21 -- 3.53	0.01
Facebook	1.72	1.26 -- 2.33	0.001
Nightlife listserv	Ref.	--	
Sex party listserv	2.14	1.37 -- 3.36	0.001
App 1 - Pop-up ads	1.74	1.27 -- 2.40	0.001
App 2 - Banner ads	2.21	1.57 -- 3.12	< .001

Ref. = Reference group

Table 3Logistic regression predicting current or past experience taking PrEP, $n = 2903$

	AOR	95% CI	<i>p</i>
Age (in years)	1.00	0.99 -- 1.02	0.56
In a relationship, 1 = yes	0.88	0.70 -- 1.12	0.30
Participant is White, 1 = yes	0.95	0.76 -- 1.18	0.62
Sexual identity as gay, 1 = yes	1.51	1.03 -- 2.21	0.04
Number of male partners in the past 90 days	1.01	1.00 -- 1.02	0.02
Number of CAS acts in the past 90 days	1.01	1.00 -- 1.01	0.02
HIV test in the last 12 months, 1 = yes	9.96	5.39 -- 18.41	< .001
Month of enrollment (0 = Aug. 2014, 16 = Dec. 2015)	1.11	1.08 1.14	< .001
Venue of recruitment			
Hookup website	Ref.		
Facebook	6.67	0.84 -- 53.18	0.07
Nightlife listserv	12.54	1.58 -- 99.58	0.02
Sex party listserv	13.42	1.67 -- 108.1	0.02
App 1 - Pop-up ads	7.75	0.98 -- 61.20	0.05
App 2 - Banner ads	15.59	1.99 -- 122.3	0.01

Ref. = Reference group