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HIV Risk Behaviors, Perceptions, and Testing and Preexposure Prophylaxis (PrEP) Awareness/Use in Grindr-Using Men Who Have Sex With Men in Atlanta, Georgia

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Abstract

Geosocial-networking smartphone applications such as Grindr can help men who have sex with men (MSM) meet sexual partners. Given the high incidence of HIV in the Deep South, the purpose of our study was to assess HIV risk and preexposure prophylaxis (PrEP) awareness and use in a sample of HIV-uninfected, Grindr-using MSM residing in Atlanta, Georgia (n = 84). Most (n = 71; 84.6%) reported being somewhat or very concerned about becoming HIV infected. Most (n = 74; 88.1%) had been tested for HIV in their lifetimes. About three fourths (n = 65; 77.4%) were aware of PrEP, but only 11.9% currently used the medication. HIV continues to disproportionately impact MSM and represents a significant source of concern. As the number of new infections continues to rise, it is important to decrease risks associated with acquisition and transmission of HIV by increasing rates of HIV testing and the use of biobehavioral interventions such as PrEP.

Keywords

gay men's health; HIV; men who have sex with men; preexposure prophylaxis (PrEP)

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Disclosures

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Recently, the use of geosocial-networking smart-phone applications ("apps") – those that use global positioning system technology to form connections between users based on their current geographic locations (Beymer et al., 2014) – has increased among gay, bisexual, and other men who have sex with men (MSM). MSM who use apps like these (such as Grindr, Jack'd, and Scruff) can chat with other users in the nearby area, meet them in person, and engage in sexual activity. Grindr, one of the most popular and widely used of these apps, reported that it had six million users worldwide (Rendina, Jimenez, Grov, Ventuneac, & Parsons, 2014). In a sample of 146 young Grindr-using MSM in Los Angeles, 20% reported condomless anal intercourse with their last Grindr-met partner (Winetrobe, Rice, Bauermeister, Petering, & Holloway, 2014), suggesting that this behavior may be common with app-met partners. Although app use is not directly associated with increased risk for HIV transmission and acquisition, these new mobile technologies have not only generated more efficient ways for MSM to meet potential sexual partners, but have also facilitated access to a larger number of concurrent sexual partners, which has been linked to increased HIV risk (Morris & Kretzschmar, 1997).

MSM are impacted disproportionately by HIV (Centers for Disease Control and Prevention, 2012), especially MSM in the region commonly referred to as the Deep South (Lieb et al., 2011; Reif, Geonnotti, & Whetten, 2006; Reif et al., 2014; Reif et al., 2015). In 2011, the region had a higher HIV diagnosis rate and had lower HIV survival proportions than the United States overall (Reif et al., 2015). Additionally, the region had the highest death rate for persons living with HIV of any United States region (Reif et al., 2015). In 2013, Georgia ranked fifth highest among all states in terms of the number of people living with HIV. In December 2013, there were an estimated 51,510 people living with HIV. At this time, 77% of HIV infections and 79% of AIDS diagnoses in males were in MSM (Georgia Department of Health HIV/AIDS Epidemiology Section, 2015). Current recommendations from the Centers for Disease Control and Prevention (CDC) suggest that sexually active MSM should be screened for HIV antibodies every 3 months (Oster et al., 2011). Frequent HIV testing provides knowledge of one's serostatus and, if infected, promotes early pharmacotherapy and behavior changes that reduce further transmission (Crepaz & Marks, 2003; Das et al., 2010; Montaner et al., 2010). Additionally, HIV testing provides the opportunity for an individual to evaluate their risk behaviors (i.e., frequency of condomless anal intercourse) and to be counseled about reducing their risk for acquiring HIV. However, some men may delay testing due to fear of knowing their status and HIV-related stigma (Dowson, Kober, Perry, Fisher, & Richardson, 2012).

As the number of new HIV infections continues to increase, many clinicians have begun to implement new biobehavioral interventions to prevent HIV transmission, including preexposure prophylaxis (PrEP). In November 2010, the *Iniciativa Profilaxis Pre-Exposición* (iPrEx) clinical trials demonstrated that oral PrEP with a once-daily tablet containing tenofovir disoproxil fumarate and emtricitabine reduced the risk of HIV infection in at-risk MSM and transgender women by 44% relative to a placebo (Grant et al., 2010). Of those taking the drug, the relative risk reduction was 95% in those with detectable drug levels compared to those without detectable drug levels (Grant et al., 2010), emphasizing the importance of adherence to the medication regimen. In 2012, the drug received approval for use as PrEP to prevent HIV acquisition in HIV-uninfected individuals, and the CDC

subsequently released clinical practice guidelines for its use (Smith et al., 2011). Recent studies (including both transgender women and MSM) have demonstrated that PrEP is effective (Grant et al, 2010; Grant et al., 2014). Referrals for and initiation of PrEP have increased dramatically in a larger clinical practice setting in San Francisco, California since 2012. Despite high rates of sexually transmitted infections (STIs) in 657 PrEP users receiving care from this clinical practice, there were no new HIV infections in the sample (Volk et al., 2015).

Given potential difficulties of adhering to a daily medication regimen, many researchers have begun to investigate the efficacy and acceptability of alternative methods of delivering the medication. For example, in a sample of 197 young MSM in New York City, 79.2% favored a long-acting injectable form of PrEP every 3 months over a daily pill (Meyers et al., 2014). Additionally, recent clinical trials in the United Kingdom (McCormack et al., 2015) and France (Molina et al., 2015) noted that both daily and intermittent dosing of the medication were effective in reducing the incidence of HIV, compared to placebo groups. In a sample of MSM in North America (n = 3,217), having had planned condomless sexual encounters in the previous 3 months was associated with a preference for event-based PrEP dosing, while having frequent or unplanned condomless anal intercourse was associated with a preference for daily or time-driven PrEP regimens (Stack et al., 2015).

Attitudes toward PrEP and its uptake in MSM have varied widely, and awareness of its availability has increased with time (Bauermeister, Meanley, Pingel, Soler, & Harper, 2013; Grov, Whitfield, Rendina, Ventuneac, & Parsons, 2015; Mantell et al., 2014). The only study to date to examine the awareness, use, and acceptability of PrEP specifically among app users found that only 1.6% of a sample of 375 Grindr users in Los Angeles had taken PrEP (Landovitz et al., 2013). However, it is possible that uptake has increased with time. In addition, research has shown that app users were at increased risk for STIs (Beymer et al., 2014). Given that PrEP is recommended for MSM with multiple sexual partners and those who have been previously diagnosed with an STI (Smith et al., 2011), PrEP use may be highly suitable in this subset of MSM.

Given the ubiquity of geosocial-networking smart-phone application use by MSM to meet casual sexual partners (Goedel & Duncan, 2015), the high incidence of HIV in the southern United States (Lieb et al., 2011; Reif et al., 2006; Reif et al., 2014; Reif et al., 2015), and that both HIV testing and PrEP use are crucial HIV prevention strategies, the purpose of our study was to evaluate HIV risk behaviors, perceptions, and testing, and PrEP awareness and use in Grindr-using MSM residing in the Atlanta metropolitan statistical area.

Methods

Sample Recruitment

The Deep South MSM Grindr Study (described in Goedel & Duncan, 2015) was designed to assess app use behaviors, sexual risk behaviors, and HIV risk perceptions in Grindr-using MSM in the Atlanta metropolitan statistical area. In brief, consistent with prior work recruiting Grindr users into other cross-sectional studies of sexual risk behaviors and HIV prevention strategies (Burrell et al., 2012; Rendina et al., 2014), MSM in Atlanta were

recruited from Grindr using broadcast advertisements directing users to a Web-based survey delivered via Qualtrics over the course of a 3-day period in January 2015. At the end of the 72-hour period, 604 users clicked the advertisement in the app and were directed to the informed consent page of the survey. From there, 92 users provided consent and completed the questionnaire, yielding a 15.2% response rate. Response rates for similar app-based research with MSM have ranged from 9.9% (Burrell et al., 2012) to 31.9% (Rendina et al., 2014). Institutional review board approval was sought and received from the New York University Committee on Activities Involving Human Subjects prior to data collection. Precautions were taken to avoid and eliminate duplicate responses as participants could have theoretically viewed the advertisement three times during the recruitment period, but no duplicate responses were apparent.

Measures

Recent sexual behaviors—Participants were first asked whether or not they had, in the 6 months prior to enrolling in the study, engaged in receptive anal intercourse (RAI) with any partner, or insertive anal intercourse (IAI) with any partner. Next, participants provided the total number of participants with whom they had engaged in each behavior in the previous 6 months and the number of participants with whom they engaged in each behavior without a condom–hereby referred to as condomless RAI (CRAI) and condomless IAI (CIAI) in the previous 6 months.

HIV risk perception—Participants were asked to assess their perceptions of the rate of change in the number of new HIV infections in MSM (e.g., their global HIV risk perceptions) with an item reading, *"As far as you know, is the number of new HIV infections each year among gay and bisexual men increasing, decreasing, or staying about the same?"* with four response options (*increasing, decreasing, staying the same, unsure*). Next, respondents were asked to assess how significant a personal issue they considered HIV to be with four response options (*very significant, somewhat significant, not too significant, and not at all significant*). Respondents were then asked to evaluate how concerned they were about being infected with HIV (e.g., their individual-level risk perceptions) with four response options (*very concerned, somewhat concerned, not too concerned, and not at all concerned*).

HIV status and testing—HIV status was assessed based on self-report with three response options (*positive, negative, and unknown/never tested*). Lifetime testing for HIV was assessed with the question, *"Have you ever been tested for HIV?"* with two response options (*yes* and *no*). If an affirmative response was given, participants were asked, using separate questions, whether or not they were tested for HIV in the previous 12, 6, and 3 months. All three of these items had two response options (*yes* and *no*).

PrEP awareness and use—The following description of PrEP for HIV prevention was first provided to participants, "*There is a new prescription medication that people who are HIV-negative can take to lower their risk of getting HIV. It is sometimes referred to as pre-exposure prophylaxis or PrEP or by the brand name Truvada®.*" Participants were first asked, "*How much have you heard about PrEP?*" with four responses (*a lot*, *a fair amount*,

only a little, *none at all*). These responses were collapsed into two categories–PrEP aware (*a lot*, *a fair amount*, *only a little*) and PrEP unaware (*none at all*). The next item assessed current use with two response options (yes and no). Finally, the third item reading, "*Do you know anyone who has taken this medication?*" assessed use within social networks with two response options (*yes* and *no*).

Demographic characteristics—Demographic characteristics included: age (years), sexual orientation (*gay*, *bisexual*, *straight*, *other*), race/ethnicity (*White/Caucasian*, *Black/African American*, *Hispanic/Latino*, *Asian/Pacific Islander*, *Multiracial/Other*), national origin (*born in the United States*, *born outside the United States*), education (*less than twelfth grade*, *high school or equivalent*, *some college*, *Bachelor's Degree*, *Master's Degree or higher*), employment status (*working full time*, *working part time*, *not working*, *student*, *unable to work*), and past-year individual income (*less than $25,000; $25,000 to $54,999; $55,000 to $84,999; $85,000 or more*).

Data Analysis

Recruitment utilizing broadcast advertisements yielded an overall sample size of 92 participants. Given that CDC guidelines for PrEP use suggest that eligible PrEP users should be HIV-uninfected (Smith et al., 2011), eight participants who reported having an HIV diagnosis were excluded from the analyses, thus restricting the analytical sample to 84 MSM. First, we calculated descriptive statistics for demographic characteristics, HIV risk behaviors, perceptions, status, and testing and PrEP awareness and use across demographic variables and sexual behaviors. Chi-squared tests were used for categorical variables, and analysis of variance was used for continuous variables. Analyses are descriptive in nature and restricted to the bivariable level due to the small sample size (Nemes, Jonasson, Genell, & Steineck, 2009). All statistical analyses were performed in IBM SPSS Version 21.0 (IBM, Armonk, NY), and statistical significance was set at $p < .05$.

Results

Sample Characteristics

Table 1 shows the demographic characteristics of the analytical sample ($n = 84$). The average age was 31.1 years ($SD = 10.9$). Most participants ($n = 83$; 98.8%) identified as gay or bisexual. The majority of the sample ($n = 53$; 63.1%) identified as White or Caucasian. A majority of respondents ($n = 78$; 92.9%) were born in the United States. Most ($n = 82$; 97.6%) completed at least high school. Nearly three fourths ($n = 61$; 73.1%) reported currently working full time or part time. A similar proportion ($n = 62$; 74.9%) reported making less than $55,000 in the past year.

Recent Sexual Behaviors

In the previous 6 months, respondents reported engaging in IAI with an average of 4.56 partners ($SD = 5.14$) and CIAI with 1.69 partners ($SD = 2.11$). In the previous 6 months, respondents reported engaging in RAI with an average of 4.59 partners ($SD = 5.23$), and CRAI with an average of 2.38 partners ($SD = 4.40$).

HIV Risk Perception

Table 2 displays frequencies related to HIV risk perception, status, and HIV testing. Less than half (n = 36; 42.9%) of the participants were able to correctly identify that the number of new HIV infections in MSM was increasing; 17.9% (n = 15) believed this number to be decreasing, 15.5% (n = 13) believed this rate was staying about the same, and 23.8% (n =20) were unsure. Incorrect perceptions of this incidence rate in MSM were associated with higher numbers of CIAI partners in the previous 6 months [$F(3, 48) = 3.25$, $p = .030$]. Those reporting incorrect perceptions reported 2.64 partners (SD =2.66) on average, while those reporting correct perceptions reported 1.18 partners (SD = 1.44). Most participants (n = 74; 88.1%) considered HIV to be a *very* or *somewhat significant* issue for them personally, and a similar proportion (n = 71; 84.6%) reported being *very* or *somewhat concerned* about becoming infected with HIV.

HIV Status and Testing

Most participants (n = 78; 92.9%) reported a negative serostatus. Most respondents (n = 74; 88.1%) had been tested for HIV in their lifetimes, where 89.2% (n = 75) of these individuals had been tested in the previous 12 months and 70.3% (n = 59) of these individuals had been tested in the previous 6 months. Having been tested in one's lifetime was associated with higher education, where 97.6% (n = 41) of those completing a 4-year college degree or higher had been tested in their lifetimes, compared to 75.8% (n = 32) of those completing some college or less ($\chi^2[14] = 25.51$, $p = .030$).

Preexposure Prophylaxis (PrEP) Awareness and Use

Table 3 displays descriptive statistics related to PrEP awareness and use. Awareness of PrEP was common. About three fourths (n = 65; 77.4%) had heard at least a little about the medication, and almost one quarter (n = 19; 22.6%) had heard nothing at all. However, current use of the medication was comparatively low (n = 10; 11.9%). Current users were significantly older on average compared to nonusers [$F(1, 82) = 6.79$, $p = .011$]. PrEP users reported significantly higher numbers of partners on average for condomless sex across all behaviors. Compared to nonusers (M = 1.33, SD = 2.11), PrEP users reported 4.50 CIAI partners [SD = 2.17; $F(1, 50) = 15.40$, $p < .001$]. PrEP users reported 7.50 CRAI partners (SD =7.40), while those not using PrEP reported 1.53 CRAI partners [SD = 3.09; $F(1, 40) = 12.059$, $p = .001$].

About one third (n =32; 38.1%) reported knowing someone who had taken PrEP. Higher individual income was associated with knowing someone who had taken PrEP; where 68.4% (n = 13) of those making $55,000 or more knew someone who had taken PrEP, compared to only 30.2% (n = 19) of those making $54,999 or less ($\chi^2[14] = 29.04$, $p = .010$).

Discussion

HIV continues to be a significant personal issue and source of concern for MSM. A majority of our sample considered HIV a *very significant* or *somewhat significant* issue to them personally and reported being *very concerned* or *somewhat concerned* about becoming infected with HIV. However, a small portion of MSM in our sample may consider HIV a less

significant personal issue or report being less concerned about becoming infected with HIV for a number of reasons. Reduced concern about HIV has been associated with the availability of antiretroviral therapy (Crepaz, Hart, & Marks, 2004; Doyle et al., 2014; Ostrow et al., 2002). HIV may be considered by some MSM to be a disease of the past rather than a risk existing in the present, especially young MSM who may not know someone living with HIV or may not have lost someone close to them to HIV (Halkitis, 2014; Hamel et al., 2014). Because these individuals do not perceive themselves to be at risk, they may engage in condomless sexual behaviors.

Of the respondents reporting being tested for HIV in their lifetimes, 89.2% ($n = 66$) of these men reported being tested in the previous 12 months. Similar percentages have been observed in a sample of Grindr users in New York City, where 90% were tested in their lifetimes, and 71% were tested in the prior year (Rendina et al., 2014). Past-year testing rates were higher in individuals achieving higher education levels; and this may be due to an increased awareness of the benefits of frequent HIV testing and increased personal concern regarding one's health status.

Awareness of PrEP has increased with time. As an example, in a community-based sample of 206 MSM in New York City, the percentage of those having heard of PrEP increased from 53.0% in 2011 to 72.4% in 2013 (Grov et al., 2015). This increase accompanied the publication of the iPrEx trials results in 2011, approval of the medication by the Food and Drug Administration in 2012, and continued media campaigns for and against it in 2013 and onward. We found that awareness at the time of data collection (January 2015) was higher than recent estimates at 77.4%. Despite high levels of awareness, reported use was comparatively low ($n = 10$; 11.9%). Importantly, this was one of few PrEP studies in MSM in the Deep South, a region of the country disproportionately impacted by HIV (Lieb et al., 2011; Reif et al., 2006; Reif et al., 2014; Reif et al., 2015).

Low PrEP uptake is potentially due to perceived cost, given that knowing someone who had used PrEP was associated with higher income. In a population-based sample of MSM presenting for HIV testing in San Diego, California who were offered PrEP and education about potential efficacy, the most common reason (48.0%) for declining was feeling that the drug was too expensive (King et al., 2014). Uptake of the medication was also associated with knowing someone who had taken the drug. As such, targeting the social networks of MSM may be an important strategy to increase both awareness and uptake of PrEP use. Given the low rates of PrEP uptake in this sample, future research should focus on a wide range of motivational and structural barriers to use, including sources of health care and status of heath insurance and their impacts on access to PrEP.

More importantly, for PrEP users, condomless sexual behaviors were substantially more common, as numbers of partners for condomless anal intercourse behaviors were three to five times higher for PrEP users compared to nonusers. According to risk compensation theories, individuals adjust their behaviors in response to changes in risk perception (Adams, 1995; Wilde, 1994). Risk compensation has been linked to increases in sexual risk behavior coinciding with the introduction of antiretroviral therapy, referred to as "treatment optimism" (Crepaz et al., 2004). So-called "PrEP optimism" may result in increased risk

behavior that could potentially reduce its effectiveness (Desai et al., 2008; Kessler et al., 2014). Concerns about risk compensation in PrEP users were common in social media campaigns against the medication (Grov et al., 2015), despite no evidence to support those concerns from clinical trials (Marcus et al., 2013). However, without information regarding the sexual behaviors of these individuals prior to initiating PrEP use, it is difficult to contextualize this finding.

The results of our investigation should be considered in light of their limitations. First, our sample is a relatively small sample of MSM in Atlanta recruited exclusively from one app (Grindr). A substantial percentage of individuals (83.9%) who saw the advertisement and clicked on it did not complete the survey, so the sample is likely to be biased by some degree of self-selection. However, this is the first study, to our knowledge, to evaluate HIV risk perception, and testing and PrEP awareness and use in a sample of app-using MSM in the Deep South, an at-risk population in a high-HIV-prevalence region. Additionally, a majority of this sample is White, employed or in school, and had at least some level of higher education. Because research has suggested that White MSM and MSM who have obtained higher levels of education are more aware of the availability of PrEP and are more frequently tested for HIV (Irvin et al., 2014; Liu et al., 2008; Mimiaga, Case, Johnson, Safren, & Mayer, 2009), future research should focus on disparities in racial/ethnic minority and low-income MSM, especially in Atlanta and the Deep South, in access to and utilization of HIV testing and PrEP awareness and use.

Secondly, behaviors were assessed with self-report measures in our study. While there can be some misclassification in self-report measures, the survey was conducted anonymously, so answers may be more likely to be accurate and honest. Measures of recent sexual behaviors are relatively crude, as the number of partners indicated might not necessarily be equivalent to the number of instances an individual engaged in condomless sexual behavior, and thus there may be some misclassification with regard to risk. Future research should employ event-based analyses to evaluate the combined effects of partner characteristics (including HIV status), specific risk behaviors, and the frequency of these behaviors.

Conclusion

HIV continues to disproportionally impact MSM and, as such, represents a significant personal issue and source of concern for many MSM. However, those perceiving HIV as a health problem decreasing in magnitude may increase their risk for infection by engaging in frequent condomless anal intercourse behaviors. As the number of new HIV infections continues to rise in this population, it is important to identify new infections by increasing rates of HIV testing and to decrease risks associated with acquisition of the virus by increasing awareness of, access to, and use of biobehavioral interventions such as PrEP.

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Key Considerations

- Incorrect perceptions regarding the magnitude of the HIV epidemic were associated with more frequent condomless sexual behaviors. Education campaigns should foster up-to-date and scientifically based perceptions of the HIV epidemic in the United States.
- Further research should elucidate barriers to preexposure prophylaxis uptake in men who have sex with men in areas of the Deep South, such as Atlanta, that are disproportionately impacted by HIV.

Table 1

Sample Demographics (n = 84)

	% (*n*)
Sexual orientation	
Gay/homosexual	76.2 (64)
Bisexual	22.6 (19)
Other	1 (1.2)
Race/ethnicity	
White/Caucasian	63.1 (53)
Black/African American	17.9 (15)
Hispanic/Latino	10.7 (9)
Asian/Pacific Islander	3.6 (3)
Multiracial/other	4.8 (4)
National origin	
Born in the United States	92.9 (78)
Born outside the United States	7.1 (6)
Education	
Less than 12th grade	2.4 (2)
High school (or equivalent)	11.9 (10)
Some college	35.7 (30)
Bachelor’s degree	35.7 (30)
Master’s degree or higher	14.3 (12)
Employment status	
Working full time	57.1 (48)
Working part time	16.7 (14)
Not working	11.9 (10)
Student	11.9 (10)
Unable to work	2.4 (2)
Individual income	
Less than $25,000	38.1 (32)
$25,000 to $54,999	36.9 (31)
$55,000 to $84,999	15.5 (13)
$85,000 or more	7.1 (6)

Table 2

HIV Risk Perception and Testing

	% (*n*)
Significance of HIV as a personal issue	
Very significant	54.8 (46)
Somewhat significant	33.3 (28)
Not too significant	9.5 (8)
Not at all significant	2.4 (2)
Concern about acquiring HIV	
Very concerned	42.9 (36)
Somewhat concerned	41.7 (35)
Not too concerned	13.1 (11)
Not at all concerned	2.4 (2)
Self-reported HIV status	
Negative	92.9 (78)
Unknown/never tested	7.1 (6)
HIV testing frequency	
Tested in lifetime	88.1 (74)
Tested in previous 12 months	78.6 (66)
Tested in previous 6 months	61.9 (52)
Tested in previous 3 months	36.9 (31)

Table 3

PrEP Awareness and Use

	% (*n*)
PrEP awareness	
Yes	77.4 (75)
No	22.6 (19)
Current PrEP use	
Yes	11.9 (10)
No	88.1 (74)
Knows someone using PrEP	
Yes	38.1 (32)
No	52.4 (44)
Don’t know/not sure	8.3 (7)

Note: PrEP = preexposure prophylaxis.