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Grindr Users Take More Risks, but Are More Open to Human Immunodeficiency Virus (HIV) Pre-exposure Prophylaxis: Could This Dating App Provide a Platform for HIV Prevention Outreach?

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Background. Technology has changed the way that men who have sex with men (MSM) seek sex. More than 60% of MSM in the United States use the internet and/or smartphone-based geospatial networking apps to find sex partners. We correlated use of the most popular app (Grindr) with sexual risk and prevention behavior among MSM.

Methods. A nested cohort study was conducted between September 2018 and June 2019 among MSM receiving community-based human immunodeficiency virus (HIV) and sexually transmitted infection (STI) screening in central San Diego. During the testing encounter, participants were surveyed for demographics, substance use, risk behavior (previous 3 months), HIV pre-exposure prophylaxis (PrEP) use, and Grindr usage. Participants who tested negative for HIV and who were not on PrEP were offered immediate PrEP.

Results. The study included 1256 MSM, 1090 of whom (86.8%) were not taking PrEP. Overall, 580 of 1256 (46%) participants indicated that they used Grindr in the previous 7 days. Grindr users reported significantly higher risk behavior (greater number of male partners and condomless sex) and were more likely to test positive for chlamydia or gonorrhea (8.6% vs 4.7% of nonusers; $P = .005$). Grindr users were also more likely to be on PrEP (18.7% vs 8.7% of nonusers; $P < .001$) and had fewer newly diagnosed HIV infections (9 vs 26 among nonusers; $P = .014$). Grindr users were also nearly twice as likely as nonusers to initiate PrEP (24.6% vs 14%; $P < .001$).

Conclusions. Given the higher risk behavior and greater acceptance of PrEP among MSM who used Grindr, Grindr may provide a useful platform to promote HIV and STI testing and increase PrEP uptake.

Keywords. HIV risk; dating app; pre-exposure prophylaxis; substance use; risk behavior.

Men who have sex with men (MSM) represent the predominant risk group for human immunodeficiency virus (HIV) infection in the United States, and technology has changed the way MSM socialize and seek sex [1]. While social media networks mostly reflect real-world offline relationships, dating apps focus on meeting new sexual partners. More than 60% of MSM in the United States have used a dating app to meet a sexual partner in the past year [2–5]. Grindr, a sophisticated geosocial networking app, is the most frequently used dating app in the United States [6].

The risk of HIV infection within MSM is not uniform [7]. Although there are conflicting data regarding whether this translates into increased HIV acquisition, studies have indicated that MSM who use Grindr have a greater frequency of condomless anal intercourse, a higher incidence of sexually transmitted infections (STIs), and more sexual partners [3, 8–11]. Meeting partners over Grindr or other geosocial networking apps may also facilitate serostatus disclosure, serosorting, negotiation regarding condom usage, discussion of sexual practices, and user risk assessment, therefore lowering overall risk [6, 12, 13]. Although Grindr may also serve as a forum to discuss HIV, the use of pre-exposure prophylaxis (PrEP) [14, 15] among Grindr users remains a underexplored topic [16].

We aimed to assess Grindr activity among MSM undergoing HIV and STI screening in San Diego, California. We then examined how Grindr use correlated with risk and prevention behavior, particularly focusing on PrEP use. We believe that this information can be used both to characterize HIV risk in this

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population and advance strategies to use geosocial networking apps as platforms to promote HIV prevention.

MATERIALS AND METHODS

Setting and Participants

The study was conducted between September 2018 and June 2019 and leveraged our “Good to Go” HIV and STI screening study for participant recruitment. Formerly named the Early Test, this community-based HIV and STI screening program provides free testing to adult MSM and transgender women participants who are willing to enroll and answer risk-related questions [17, 18]. The program utilizes a point-of-care rapid HIV test followed by routine reflex to individual donation HIV nucleic acid amplification testing in persons with negative rapid test results. STI screening assessments include syphilis (using the reverse screening algorithm [19]), *Chlamydia* species, and gonorrhea by nucleic acid amplification test of urine, pharyngeal, and rectal swab specimens (Cepheid Xpert CT/NG, Sunnydale, California). Data are collected by bilingual (Spanish and English) testing staff before each testing encounter including demographics, sexual risk, number of sex partners, substance use (all in the previous 3 months), and PrEP use [18]. Participants who test positive for HIV or STIs are offered immediate treatment at no cost. Those at substantial risk for HIV acquisition [20] who test negative for HIV and are not currently prescribed emtricitabine/tenofovir disoproxil fumarate (FTC/TDF) for PrEP are offered immediate PrEP.

Measures

Assessment of Grindr Activity, HIV Risk, and PrEP Use

During their testing encounter, all MSM and transgender women participants presenting for “Good to Go” were surveyed for Grindr usage (ie, opening Grindr on their mobile device during the previous 7 days), demographics, substance use, and HIV risk behavior during the previous 3 months, and PrEP use (ie, any PrEP intake during the last 14 days). Participants with iPhones were instructed on how to assess Grindr on-screen activity (ie, time on screen during the last 7 days; automatically recorded by phones) on their phones, and provided that data via the questionnaire (Figure 1).

Classification of Risk Behavior

This study utilized the San Diego Early Test (SDET) score as a measure of risk behavior for the target MSM population [7, 21]. The score focuses on current risk for HIV acquisition among MSM: condomless receptive anal intercourse (CRAI) with an HIV-positive MSM, combination of CRAI plus number of male partners, and recent bacterial STI [7, 21]. In the derivation and validation cohorts used to derive the score, symptoms and risk behaviors were both assessed for the 12 months prior to the testing encounter. To take into account the 3-month risk reporting period in “Good to Go,” we created an “adjusted SDET”

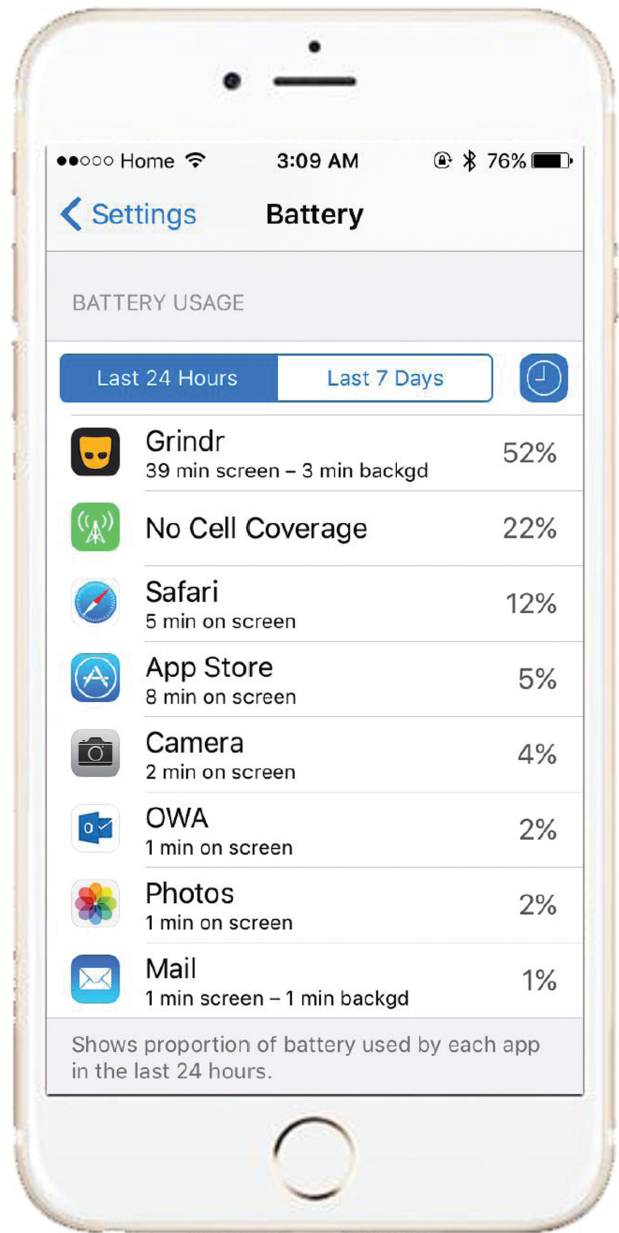


Figure 1. iPhone system app that assesses Grindr on-screen activity.

by adjusting 2 original variables: “the combination of CRAI plus ≥ 5 male partners in the previous 12 months” to “the combination of CRAI plus ≥ 2 male partners in the previous 3 months,” and “ ≥ 10 male partners in the previous 12 months” to “ ≥ 5 male partners in the previous 3 months,” as described elsewhere [22]. We also combined self-reported recent STI with new STI diagnosis at the testing encounter into 1 variable that informed SDET calculation. While the score focused on sexual risks, changes in sexual behavior associated with substance use were also captured [23].

PrEP Initiation

All participants with HIV risk behavior who tested negative for HIV and reported no PrEP use during the last 14 days were

offered immediate PrEP beginning in November 2018. For these participants, the first 30 days of PrEP were provided via the “Good to Go” study.

Statistical Analysis

All statistical analyses were conducted using SPSS 25 software (SPSS Inc, Chicago, Illinois). Demographics, PrEP use, PrEP initiation, substance use, risk behaviors, adjusted SDET scores, and HIV/STI diagnoses were compared between participants who reported recent Grindr use vs those who did not using Fisher exact test/ χ^2 test for categorical variables and Student *t* test/Mann-Whitney *U* test for continuous variables. Univariate and multivariable logistic regression analyses assessed predictors of initiating PrEP after the testing encounter. Variables with a *P* value <.2 in univariate analysis were included in the multivariable model. Variables in the final model were selected with a stepwise forward procedure. Model discrimination was assessed by the goodness-of-fit Hosmer-Lemeshow statistics. Odds ratios (ORs) and adjusted odds ratios (aORs) including 95% confidence intervals (CIs) were calculated and a *P* value of <.05 was considered statistically significant. The study was approved by the University of California, San Diego institutional review board and written informed consent was obtained from all participants.

RESULTS

Survey data were collected from 1256 consecutive MSM and transgender women who participated in the “Good to Go”

study between September 2018 and June 2019 (Table 1). Median age was 32 years (range, 18–78 years); 421 (33.5%) reported Hispanic ethnicity, 532 were non-Hispanic white (42.3%), 140 non-Hispanic Asian (11.1%), 80 non-Hispanic black (6.4%), and 83 (6.6%) non-Hispanic mixed or other races. The majority identified as male (*n* = 1237 [98.5%]), and 1017 participants (81%) reported their sexual orientation as gay, 187 (14.9%) as bisexual, 21 (1.7%) heterosexual, and 31 another sexual orientation (2.5%), with all 1256 participants reporting sex with men.

Grindr Use, Risk Behavior, and Testing Outcomes

A total of 580 of 1256 (46%) participants (including 571 men, 5 transgender women, and 4 who identified as other gender) indicated that they had opened Grindr during the previous 7 days. Demographic data, risk behavior, and substance use in participants with and those without recent Grindr use are displayed in Table 1.

Grindr users had higher adjusted SDET risk behavior scores than those not using Grindr (median SDET score, 2 [interquartile range {IQR}, 0–5] vs 0 [IQR, 0–3]; *P* < .001), driven mostly by having more male sexual partners (median number of male sex partners in the last 3 months, 4 [IQR, 2–7] vs 2 [IQR, 1–4]; *P* < .001). There were also tendencies toward Grindr users more frequently reporting CRAI (297/580 [51.2%] vs 310/676 [45.9%]; *P* = .059) or recent illicit substance use (113/580 [19.5%] vs 105/676 [15.5%]; *P* = .065), whereas there was no difference in self-report of recent bacterial STI diagnosis (3.4% of study population; *P* = .5).

Table 1. Demographic Data, Risk Behavior, Substance Use Characteristics, and Testing Outcomes of Participants Who Did and Did Not Report Recent Grindr Use

Variable	Grindr Users ^a (n = 580)	Grindr Nonusers ^a (n = 676)	<i>P</i> Value
Gender			.976
Male	571 (98)	666 (99)	
Transgender female	5 (1)	6 (1)	
Other nonbinary identity	4 (1)	4 (1)	
Age, y, mean (SD)	35 (12)	38 (13)	< .001
Race/ethnicity			.502
White	371 (64)	420 (62)	
Hispanic	200 (34)	221 (33)	.555
Adjusted SDET score, median (IQR)	2 (0–5)	0 (0–3)	< .001
Male sex partners (recent 3 mo), median (IQR)	4 (2–7)	2 (1–4)	< .001
No. reporting condomless anal intercourse (recent 3 mo)	297 (51)	310 (46)	.059
Substance use ^b	113 (19)	105 (16)	.065
Self-reported PrEP intake within last 14 d	107 (18)	59 (9)	< .001
Self-reported recent bacterial STI diagnosis (recent 3 mo)	22 (3.8)	21 (3.1)	.505
Testing positive for HIV	9 (6)	26 (3.8)	.014
Testing positive for chlamydia or gonorrhea	50 (8.6)	32 (4.7)	.005
Testing positive for syphilis	13 (2.2)	11 (1.6)	.428
Testing positive for HCV	0	4 (0.6)	.129

Data are presented as no. (%) unless otherwise indicated.

Abbreviations: HCV, hepatitis C virus; HIV, human immunodeficiency virus; IQR, interquartile range; PrEP, pre-exposure prophylaxis; SD, standard deviation; SDET, San Diego Early Test; STI, sexually transmitted infection.

^aDefined as within last 7 days.

^bSubstances: metamphetamine, cocaine, GHB, poppers, ecstasy, ketamine.

Grindr users were more likely to test positive for chlamydia or gonorrhea at their testing encounter (50/556 [8.6%] tested positive for 1 or both vs 32/676 [4.7%] of Grindr nonusers; $P = .005$). Grindr users were overall less likely to test positive for HIV (9/580 [1.6%] vs 26/676 [3.8%] of Grindr nonusers tested positive; $P = .014$), whereas no difference was observed for syphilis and HCV diagnoses (Table 1).

Grindr Use and PrEP

Of 1256 participants, 1090 (86.8%) reported that they were not taking PrEP (defined as no PrEP intake within last 14 days). Grindr users were more likely to be taking PrEP than Grindr nonusers (107/580 [18.4%] among Grindr users vs 59/676 [8.7%] nonusers; $P < .001$). Overall, 472 of 1087 (43.4%) of participants who were not taking PrEP reported recent Grindr use. Among those participants who were not taking PrEP, Grindr users had significantly higher sexual risk behavior (median SDET score, 2 [IQR, 0–5] vs 0 [IQR, 0–3] among Grindr users vs nonusers, respectively; $P < .001$; median numbers of male sex partners, 4 [IQR, 2–6] vs 2 [IQR, 1–4]; $P < .001$), but no difference was observed regarding CRAI and recent illicit substance use.

From November 2018 when immediate PrEP was made available at our community-based program, PrEP-eligible Grindr users were nearly twice as likely to start PrEP after the testing encounter compared to nonusers (100/406 [24.6%] of Grindr users started PrEP vs 72/514 [14.0%] of nonusers; $P < .001$). In the multivariable logistic regression analysis, recent Grindr use (OR, 1.61), adjusted SDET score (OR, 1.20 per score point), younger age (OR, 0.96 per year), and diagnosis of chlamydia or gonorrhea infection at “Good to Go” testing encounter (OR, 2.00) were significant and independent predictors of PrEP initiation (Table 2).

Grindr On-screen Activity

Of 580 MSM who indicated recent Grindr use, 376 (64.8%) were iPhone users, of which 340 had their iPhone with them at the testing encounter. This allowed us to objectively assess screen time on Grindr. Median on-screen activity during the previous

7 days was significantly higher in those who reported PrEP use within the last 14 days (60/340 [18%]), compared with those who did not (280/340 [82%]); median on-screen time over the previous 7 days was 244 minutes (IQR, 75–534) in those with PrEP vs 142 minutes (IQR, 47–360) in those without ($P = .017$).

Overall, there was no significant correlation between adjusted SDET scores and Grindr on-screen activity among those not on PrEP ($P > .5$); however, those at highest risk for HIV (SDET score ≥ 8), had a trend toward being the highest Grindr utilizers (ie, >90th percentile of time on screen corresponding to >660 minutes during the last 7 days; 5/25 [25%] of those with highest sexual risk vs 21/255 [8.2%] of those with lower sexual risk; $P = .053$).

DISCUSSION

Over the last decade, MSM have increasingly utilized geosocial dating apps to find sex partners [24]. This study assessed use of the most popular app in 1256 MSM and transgender women undergoing community-based HIV and STI screening in San Diego. In our sample, those who use Grindr reported behaviors that placed them at greater risk for HIV. Although Grindr users were more likely than nonusers to be taking PrEP, more than 8 in 10 were not using FTC/TDF at the time of their testing encounter. Grindr users were more likely to initiate PrEP after the testing encounter, indicating that Grindr could serve as a platform for educating those at high risk for HIV about the benefits of PrEP and linking users to programs that offer PrEP.

Consistent with previous reports, Grindr users in our study had higher sexual risk and were more likely to test positive for chlamydia and gonorrhea infections [4, 10, 11]. Additionally, we found that Grindr users were more likely to have taken PrEP within 2 weeks before the testing encounter (18.7% among Grindr users vs 8.7% among nonusers) and were overall—possibly as a consequence—less likely to test positive for HIV (9 new diagnoses among Grindr users vs 26 new diagnoses among nonusers). Importantly, the majority of Grindr users (81.3%) were not on PrEP, despite having significantly higher sexual risk behavior compared to nonusers. After the testing encounter,

Table 2. Univariate and Multivariable Binary Logistic Regression Models for Predicting Initiation of Pre-exposure Prophylaxis (PrEP) Among Participants Offered PrEP Through the Total Test (n = 920, of Whom 172 Initiated PrEP)

Model	Univariate Model			Multivariable Model ^a		
	OR	(95% CI)	PValue	aOR	(95% CI)	PValue
Recent Grindr use	2.006	(1.433–2.808)	< .001	1.611	(1.129–2.299)	.009
Adjusted SDET score (per point)	1.250	(1.174–1.331)	< .001	1.196	(1.116–1.282)	< .001
Age (per year)	0.960	(.944–.976)	< .001	0.964	(.948–.981)	< .001
Substance use last 3 mo	1.634	(1.090–2.450)	.017	NS	...	
Diagnosis of chlamydia or gonorrhea infection at testing encounter	3.751	(2.139–6.576)	< .001	1.996	(1.076–3.701)	.028
Hispanic ethnicity	1.381	(.983–1.940)	.063	NS	...	

Abbreviations: aOR, adjusted odds ratio; CI, confidence interval; NS, not significant; OR, odds ratio; SDET, San Diego Early Test.

^a $\chi^2 = 6.077$, $P = .639$, Hosmer-Lemeshow; forward Wald binary logistic regression.

Grindr users were more likely to start PrEP through our program (24.6% of Grindr users started PrEP vs 14% of nonusers), and Grindr use remained an independent predictor of PrEP initiation in multivariate analysis (other predictors were higher sexual risk, younger age, and chlamydia/gonorrhea diagnosis). One explanation for the comparatively high rate of PrEP initiation among Grindr users despite low current PrEP usage is that PrEP has simply not been previously made readily available to them before—a linkage that may have been enhanced by HIV testing and counseling, review of HIV risks, or a positive STI screen.

This study also introduced an objective measure of Grindr on-screen activity, allowing quantification of active Grindr use in minutes. Among Grindr users, those with the highest sexual risk behavior were found to be actively using Grindr significantly more compared to those with lower sexual risk behavior. Characterization of Grindr on-screen activity may be a useful tool for identifying MSM and transgender women who may benefit the most from PrEP and more frequent STI testing.

Given the higher risk behavior and greater acceptance of PrEP among Grindr users, PrEP promotional messages and linkages to care on the Grindr platform could enhance PrEP uptake, as well as increase testing for HIV and STIs. The surge of dating apps and their association with high-risk sex offers unique opportunities for broad delivery of prevention messages [11, 25]. Grindr may provide a real opportunity to reach those at risk and substantially increase PrEP awareness and uptake. However, how to effectively deliver these messages on Grindr needs to be further evaluated. Grindr commercially offers banner ads, which can convey an HIV prevention message allowing messages to be targeted toward specific regions with messages that are tailored toward specific PrEP providers. Previous studies evaluated Grindr ads for recruitment for HIV prevention interventions [26–30], and found that Grindr ads can help recruitment for HIV prevention efforts, particularly among older MSM. However, generic banner ads may be less effective at reaching hidden populations [28, 30–32], and ad costs are generally predicted to increase [25, 28, 31]. Banners and advertisements generally do not harness the social dimension of geospatial networking apps. Behavior and behavior change diffuse through social networks of close ties and are affected by individuals' perceptions of what their network members do [33–35]. Therefore, a more personalized delivery of prevention messages, for example, via advertisement on profile pictures of selected opinion leaders, may be more effective than banner ads for delivering prevention messages to Grindr users. Indeed, network-based recruitment has proven very effective at locating people with undiagnosed HIV infections [36, 37]. To further enhance PrEP use, Grindr profiles could potentially also incorporate a function that allows users to disclose whether they are on PrEP. Each of these approaches warrant further investigation.

There are important limitations to this study. The study took place at a single community-based testing site; thus, our findings might not be generalizable to other locations and populations. Furthermore, slight modifications of the previously validated SDET risk score were necessary to fit our available data and analyses. PrEP use was evaluated based on self-reported PrEP intake during the last 14 days only. Therefore, the study may have not consistently captured on-demand PrEP users [38], and thereby slightly underestimated the number of PrEP users among both Grindr users and nonusers. Future studies should consider assessing on-demand PrEP use and to also incorporate objective measures of PrEP use to help establish if Grindr also translates to higher adherence. We also did not collect data on the usage of other geospatial networking app platforms (such as Scruff, Hornet, etc), which may be used by persons who have a higher risk profile or had a similar risk profile and biased the results of comparisons between Grindr users and nonusers toward the null. Nevertheless, with Grindr being the most popular app, it is likely that users of these other apps were also Grindr users. Finally, our subanalysis on on-screen activity was limited to iPhone users.

In conclusion, Grindr users took more sexual risks and had more partners than those who did not use the geosocial networking app, but they also were more likely than nonusers to take PrEP or initiate PrEP. These findings suggest that Grindr could be an effective vehicle for reaching people at risk for contracting HIV or other STIs, to encourage HIV and STI testing, and to engage them to start PrEP.

Notes

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