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Reducing the discussion divide by digital questionnaires in healthcare settings: Disruptive innovation for HIV testing and pre-exposure prophylaxis (PrEP) screening

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Abstract

Background: Healthcare provider assessment of patient sexual behavior and substance use is essential for determining appropriate prevention interventions—including HIV pre-exposure prophylaxis (PrEP)—for sexual minority men (SMM). We sought to explore acceptability and utility of using electronic surveys to conduct health behavior assessments in clinical settings among SMM.

Methods: Among a U.S. nationwide sample of SMM (n=4187; mean age = 38.3 years; 60% White; 82% HIV-negative), we examined associations of demographics, recruitment venue, sexual behavior characteristics, and recent substance use with participants' comfort communicating verbally and via electronic survey with a healthcare provider about sexual and substance use behavior.

Results: On average, SMM had greater comfort communicating via electronic survey vs. verbally. In our fully-adjusted analysis, preference favoring electronic surveys more strongly than verbal communication differed by age (β=−0.07, $p\leq$0.001). SMM with a Bachelor's degree or more (β=0.04, p<0.05), those recruited from non-clinical settings (β=0.06, $p\leq$0.001), and those without primary care providers (β=0.04, p<0.05) favored electronic surveys more strongly in the

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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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fully-adjusted multivariable model. SMM who reported any recent casual sex partners (β=0.05, p<0.01), those never tested for HIV (β=0.03, p<0.05), and HIV-negative/unknown men not on PrEP (compared to PrEP users; β=0.09, $p\leq$0.001) also favored electronic surveys in the fully-adjusted model.

Conclusions: Reducing communication barriers by incorporating electronic surveys into patient assessments could help identify HIV testing and PrEP needs for SMM most susceptible to HIV acquisition. Nonetheless, no one screening strategy is likely to work for a vast majority of SMM and multiple approaches are needed.

Keywords

HIV; HIV testing; pre-exposure prophylaxis; sexual minority men; gay and bisexual men

INTRODUCTION

Gay, bisexual, and other men who have sex with men—referred to herein as sexual minority men (SMM)—are disproportionately affected by HIV in the United States (US).[1] The US has initiated a plan to *End the HIV Epidemic*[2] with four pillars of focus including early diagnosis of people living with HIV, treatment of people living with HIV to achieve viral suppression and halt onward sexual HIV transmission risk,[3–5] bolstering primary biomedical prevention using pre-exposure prophylaxis (PrEP) and other evidence-based strategies, and responding to HIV outbreaks. The Centers for Disease Control and Prevention recommends all sexually active, sexual minority men be tested for HIV at least annually, with more frequent testing encouraged for some based on an individual's sexual behavior (e.g., number of condomless sex partners), local HIV epidemiology, and/or local polices.[6] Although PrEP is highly effective as a primary HIV prevention tool,[7] HIV testing is the first step in determining the recommended course of treatment or preventative services within routine primary care.

Difficulty communicating about sensitive sexual behaviors and substance use with healthcare providers is a critical barrier to individuals receiving HIV prevention-related care. Previous research among nationwide samples of SMM[8–10] identified suboptimal rates of disclosure of sexual orientation and same-sex sexual activity to healthcare providers, despite evidence supporting its importance for the delivery of preventive care.[11,12] Specific barriers to disclosure include fears of stigma and discrimination.[13] Moreover, the disclosure of substance use to healthcare providers is essential for the delivery of alcohol and drug abuse treatment and HIV prevention services among SMM because of the influence of substance use on sexual behavior.[14] Missed opportunities for HIV testing and other preventive care measures can impede efforts to halt HIV transmission.[15] Although low perceptions of HIV risk are a barrier to HIV testing and engagement in prevention methods including PrEP,[16–21] SMM who have a healthcare provider recommending prevention services are more likely to engage in behaviors including HIV testing and human papillomavirus vaccination.[22–24]

The importance of provider-initiated care has led researchers to develop algorithm-based, electronic, and machine learning methods to identify individuals who could benefit from specific preventive care. These interventions would allow—for example—automated

reminders and recommendations to pop up within an electronic health record based on the data entered. Several tools to support clinical assessment have been developed based on patients' self-reported behaviors.[25–28] The precision of these tools is likely dependent upon the accuracy of the data provided by a patient, which could be affected by the comfort of the patient responding to questions about sexual behavior and substance use—behaviors often layered with stigma.[29,30] To overcome some of the discomfort arising from discussing stigmatized behaviors, studies suggest that electronic surveys or assessments could improve the accuracy of this data. For example, a randomized controlled trial within London sexual health clinics found that electronic surveys captured more sensitive behaviors than in-person assessments,[31] and computer-assisted survey interviews in research settings were found to increase reporting of sensitive sexual behaviors.[32] Researchers have also identified prediction models useful for classifying individuals who could benefit from PrEP based on medical record data and hope to implement these models in electronic health record systems to automate screening.[33–35] Nonetheless, methods of determining optimal candidates for PrEP and other preventative care services continue to require input of accurate data about sexual behavior, substance use, and other patient characteristics.

Under the premise of increasing HIV testing and PrEP uptake among SMM in the US, we sought to determine comfort levels of SMM to disclose sensitive sexual and substance use behaviors to healthcare providers using two strategies: (1) verbal communication with a healthcare team member and (2) via electronic survey. We then compared levels of comfort between the two strategies to determine a more acceptable strategy for collecting sexual and substance use data among participants most susceptible to acquiring HIV in a nationwide sample of SMM. Correlates of communication comfort were then examined to determine tailored preferences among specific subgroups of SMM based on sexual behavior and substance use characteristics. Given prior evidence supporting the interest of SMM in communicating with healthcare providers through technology-mediated platforms (e.g., geosocial networking apps)[36] and feasibility of telehealth interventions for PrEP,[37,38] we hypothesized SMM would prefer electronic health surveys compared to answering verbal health behavior questions asked within clinical settings.

METHODS

Data for this analysis were collected between May 2016 and March 2017 and comprised of SMM samples recruited via five different venues. As described previously,[39,40] individuals had to be 18 years or older, cisgender male, and report sex with a man in the past 5 years to be eligible. The five recruitment venues were: (1) HIV and sexual health clinic waiting rooms in New York City, (2) online men-for-men sexual networking and porn websites, (3) men-for-men geosocial networking apps via mobile devices, (4) social media via Facebook, and (5) field-based recruitment using tablet survey devices in gay neighborhood settings. Online surveys were self-administered, anonymous, and administered in English. Nominal incentives were offered for participation, varied by recruitment venue, and included local movie theater tickets, $1 scratch off lottery tickets, or a drawing for $20 e-gift cards. All study procedures were approved by the Institutional Review Boards of the City University of New York and Albert Einstein College of Medicine.

Measures

Demographics and Recruitment Venue.—We asked participants their age, race/ethnicity, and educational attainment. Individuals were also coded by recruitment venue, which we dichotomized into clinic-based recruitment versus online and field recruitment.

Relationship Status, Sexual Behavior, Substance Use, HIV-Status, and PrEP Use.—Individuals were asked to report their relationship status, engagement in sexual activity with casual sex partners (past 3 months), lifetime HIV testing history, and substance use (past 3 months) including ketamine, MDMA, GHB/GLB, cocaine, marijuana, hazardous alcohol use, prescription drug use without prescription, and injection drug use. We also asked about HIV-status and current PrEP use, which we coded into: (1) HIV-positive; (2) HIV-negative, currently taking PrEP; and (3) HIV-negative or unknown status, not currently taking PrEP.

Outcomes.—Respondents first answered questions (described above) about sexual behavior with main and causal partners, substance use, and prior HIV and sexually transmitted infection (STI) history. We then asked participants to report their comfort disclosing behaviors to a healthcare provider through two strategies labeled A and B. First, in-person comfort discussing behavior was assessed with the following question: [A] *How comfortable would you be telling your provider about the behaviors you have described so far in this questionnaire?* with response categories ranging 0 (*very uncomfortable*) to 4 (*very comfortable*) and neutral middle option (3 – *I am not sure*). Second, we asked participants about their comfort disclosing behaviors via electronic survey with the following question: [B] *Instead of telling your healthcare provider, how comfortable would you feel completing a questionnaire like this and having the results shared with your provider before you meet with [them]?* with response categories similarly ranging 0 (*very uncomfortable*) to 4 (*very comfortable*). Next, we created a difference score using the following formula: (B-A), with scores ranging −4 to 4. Scores greater than 0 indicate greater comfort for electronic health surveys, scores lower than 0 indicate greater comfort for in-person verbal health histories, and scores equal to 0 indicate the same level of comfort between the two strategies. Our three outcomes of interest were verbal communication comfort (A), electronic communication comfort (B), and differences in comfort between communication formats (B-A).

Data Analysis

Descriptive data were assessed using frequency measures. Bivariate analyses were conducted using analysis of variance (ANOVA) and Pearson's r correlation for categorical and continuous independent variables, respectively. We examined associations between demographics, recruitment venue, and HIV acquisition risk characteristics and our three outcome variables using fully-adjusted ordinary least squares linear regression models.

RESULTS

A total of 4,187 SMM completed surveys with data used for analysis (see Table 1), including participants from all 50 states, Puerto Rico, and District of Columbia. Mean age of the

sample was 38.3 years (range: 18–83). Nearly 60% of respondents were White, and 47% had a Bachelor's degree or higher education. Most (96%) were recruited outside of clinical settings, with n = 1,891 recruited from men-for-men geosocial networking apps, n = 934 from men-for-men sexual networking websites, n = 454 from porn websites, n = 454 from Facebook, n = 292 using field-based recruitment techniques, and n = 162 recruited from HIV and sexual health clinics. Most (86.2%) had primary care providers, 62% were single, 77% had a recent male casual sex partner, and 65% reported recent substance use. Nearly 94% had been tested for HIV within their lifetime. Eighteen percent of the sample reported living with HIV, 12% reported an HIV-negative status with current PrEP use, and 70% reported an HIV-negative or unknown status without PrEP use.

Mean levels of comfort with verbal communication with providers about sexual and substance use behavior was 3.40 (SD = 1.50), whereas mean levels of comfort with communication via electronic health survey was 3.57 (SD = 1.40). Half (50.7%) of the sample had the same comfort score across the two measures (i.e., a difference score of 0), while 30.2% of the sample favored electronic health surveys and 19.1% favored in-person verbal discussions about their sexual and substance use histories.

In bivariate analyses, comfort discussing sexual and substance use histories verbally differed based on most of our independent variables. Notably, differences were observed between recruitment venue; individuals recruited from clinical settings had greater comfort discussing sexual and substance use history with providers compared to those sampled from online and field venues. Individuals who hadn't tested for HIV previously, those with a recent casual male sex partner, and those who had engaged in recent substance use had lower comfort levels with verbal health histories compared to their counterparts. Similar differences in comfort with two of these groups were also seen with regard to electronic health surveys. Individuals who hadn't tested for HIV previously and those with a recent casual male sex partner had lower comfort with an electronic health survey compared to their counterparts.

HIV-related care and treatment familiarity correlated with comfort with both methods of communication. People living with HIV and men who were currently taking PrEP reported similar levels of comfort completing verbal health histories, but both of these groups had significantly higher levels of comfort with verbal health histories compared to those who were HIV-negative or unknown status and not on PrEP. Similarly, individuals who had never tested for HIV and those who reported a recent casual male sex partner also had lower comfort levels completing electronic health surveys compared to their counterparts. Notably, no differences were observed between individuals with and without primary care providers regarding comfort with verbal health histories, but SMM without primary care providers reported greater comfort discussing sexual and substance use history via electronic health survey. Younger men also reported greater comfort with electronic health surveys, where comfort decreased as age increased. Full bivariate analyses are presented in Table 2.

Fully-adjusted multivariable analyses are presented in Table 2. For brevity, our multivariable findings using only the comfort difference score are discussed next; positive coefficients in this model indicate greater comfort with electronic health surveys versus verbal health

histories. Younger men reported stronger preference with electronic health surveys, where comfort difference decreased with age. Men with a Bachelor's degree or more education had a stronger preference with electronic health surveys compared to those with lower educational attainment. Individuals recruited outside of clinical settings and those without primary care providers had stronger preferences with electronic health surveys compared to those recruited from HIV and sexual health waiting rooms and with primary care providers, respectively. Compared to those living with HIV, men who reported an HIV-negative or unknown status and were not on PrEP had stronger preference with electronic health surveys. Lastly, individuals who had not been tested for HIV in their lifetime had stronger preference with electronic health surveys. No significant differences were found by race/ethnicity, relationship status, or recent engagement in substance use.

DISCUSSION

We sought to compare levels of comfort between two strategies for obtaining sexual and substance use behavior histories to determine an optimal strategy to support determination of HIV and STI prevention needs. Our findings revealed a range of comfort with verbal discussions and an electronic health survey, indicating the benefits of offering both strategies. Nearly a third of SMM—including many with characteristics suggesting lower familiarity with health care and potentially higher susceptibility to acquiring HIV (e.g., those not currently on PrEP)—were preferentially more comfortable with electronic health surveys, indicating the necessity of adding this option within healthcare settings. Nonetheless, verbal health histories should still be considered as an option for the nearly one-in-five who found them more comfortable, especially among older SMM based our findings by age.

As our research indicates, no one screening strategy is likely to work for a vast majority of SMM—multiple approaches are needed, including electronic health surveys. Our results have important implications for expanding awareness of and access to HIV prevention services among SMM most in need. Mainly, electronic health surveys could be a way to engage individuals who currently have low levels of health care engagement. On average, younger SMM, those who reported casual male sexual partners, those who had never been tested for HIV, those surveyed outside of the clinical setting, those without primary care providers, and HIV-negative/unknown SMM not on PrEP favored electronic health surveys —all indicators of those who could most benefit from HIV testing and prevention care. Specifically, integrating electronic survey assessments into routine medical visits could be an avenue to increase the number of people engaged in health care and facilitate provider-initiated conversations about HIV and other STIs, HIV/STI testing, and methods of prevention. PrEP uptake has started to plateau in the US,[41] and using electronic health surveys could help identify additional candidates for PrEP. Electronic survey methods could also assist in expanding algorithm-based, electronic, and machine learning methods to classify individuals at risk of HIV acquisition that are currently under development for implementation,[33–35] with potential to start reaching those who have been more marginalized from health care settings previously based on our findings.

Incorporating electronic health surveys into routine primary care has other potential benefits. First, individuals recruited from non-clinical settings preferred electronic health surveys, potentially affording an avenue to reduce the stigmas associated with obtaining HIV/STI prevention services if electronic health surveys become more normative within clinical settings. Second, individuals often underestimate their perceived HIV risk,[16–19,21] and the integration of immediate, algorithm-based feedback integrated with electronic assessments could be an opportunity to help individuals reevaluate their risk prior to their visit with providers, where conversations about HIV/STI prevention and PrEP could occur. Third, electronic health surveys could be an opportunity to increase the amount of information within a patient's electronic medical record, allowing more competent care responsive to the needs of the patient. Nonetheless, electronic health surveys focused on past behavior do not reduce the need for discussions between patients and providers about future behavior and appropriate HIV prevention strategies.

We reported data supporting patient comfort with integrating electronic health surveys into routine healthcare; however, further research is needed to maximize the benefit and utility of electronic health surveys. Specifically, more research is needed to determine the reliability of this data and how to implement electronic health surveys within electronic medical records across the multiple platforms available to hospitals and clinics. Additional research is also needed to determine what concerns patients might have about these surveys, particularly if they are connected to electronic medical records, since preliminary evidence indicates mixed opinions among SMM for the integration of HIV risk prediction tools[42]—aligning with our findings about mixed preferences for the integration of electronic health surveys into clinical care. Finally, additional research is needed to determine healthcare providers' perspectives about integrating electronic health surveys into practice and the potential impact this would have on clinical practice outcomes (e.g., HIV testing and PrEP discussions).

Limitations

Our research should be understood considering its limitations. First, participants completed the survey online, using a tablet in the field or on their own device, potentially limiting generalizability. However, our field-based observations suggested this did not limit enrollment or survey completion. Second, findings may not be generalizable to all SMM because of our non-probability sampling. Third, given several recent high-profile data breaches and increased attention to concerns around digital data safety, acceptability of sharing electronic survey data with healthcare providers could change over time—study replication over time may be warranted. Finally, we asked participants about their potential comfort using hypothetical scenarios. It is unknown if hypothetical comfort will result in actual use if implemented in clinical settings. Further research is needed as scale-up occurs.

CONCLUSIONS

In this study, we sought to determine comfort of SMM to disclose sexual and substance use behaviors to healthcare providers through verbal communication and a self-report electronic health survey. We found that no one screening strategy is likely to work for a vast majority

of SMM, and multiple approaches are needed. Innovations in how we obtain sexual behavior and substance use histories and initiate prevention services are critically needed to help end the HIV epidemic in the US.

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REFERENCES

1. Centers for Disease Control and Prevention. HIV surveillance report, 2016, vol. 28 2017; https://www.cdc.gov/hiv/pdf/library/reports/surveillance/cdc-hiv-surveillance-report-2016-vol-28.pdf. Accessed January 11, 2018.
2. Fauci AS, Redfield RR, Sigounas G, Weahkee MD, Giroir BP. Ending the HIV epidemic: a plan for the United States. JAMA. 2019;321(9):844–845. [PubMed: 30730529]
3. Cohen MS, Chen YQ, McCauley M, et al. Prevention of HIV-1 infection with early antiretroviral therapy. N Engl J Med. 2011;365(6):493–505. [PubMed: 21767103]
4. Cohen MS, Chen YQ, McCauley M, et al. Antiretroviral therapy for the prevention of HIV-1 transmission. N Engl J Med. 2016;375(9):830–839. [PubMed: 27424812]
5. Rodger AJ, Cambiano V, Bruun T, et al. Risk of HIV transmission through condomless sex in serodifferent gay couples with the HIV-positive partner taking suppressive antiretroviral therapy (PARTNER): final results of a multicentre, prospective, observational study. Lancet. 2019;393(10189):2428–2438. [PubMed: 31056293]
6. DiNenno EA, Prejean J, Irwin K, et al. Recommendations for HIV screening of gay, bisexual, and other men who have sex with men - United States, 2017. MMWR Morb Mortal Wkly Rep. 2017;66(31)830–832. [PubMed: 28796758]
7. Spinner CD, Boesecke C, Zink A, et al. HIV pre-exposure prophylaxis (PrEP): A review of current knowledge of oral systemic HIV PrEP in humans. Infection. 2016;44(2):151–158. [PubMed: 26471511]
8. Petroll AE, Mosack KE. Physician awareness of sexual orientation and preventive health recommendations to men who have sex with men. Sex Transm Dis. 2011;38(1):63–67. [PubMed: 20706178]
9. Petroll AE, Mitchell JW. Health insurance and disclosure of same-sex sexual behaviors among gay and bisexual men in same-sex relationships. LGBT Health. 2015;2(1):48–54. [PubMed: 26790018]
10. John SA, Rendina HJ, Grov C, Parsons JT. Home-based pre-exposure prophylaxis (PrEP) services for gay and bisexual men: An opportunity to address barriers to PrEP uptake and persistence. PLoS ONE. 2017;12(12):e0189794. [PubMed: 29281688]
11. Ng BE, Moore D, Michelow W, et al. Relationship between disclosure of same-sex sexual activity to providers, HIV diagnosis and sexual health services for men who have sex with men in Vancouver, Canada. Can J Public Health. 2014;105(3):e186–191. [PubMed: 25165837]
12. Stupiansky NW, Liau A, Rosenberger J, et al. Young men's disclosure of same sex behaviors to healthcare providers and the impact on health: Results from a US national sample of young men who have sex with men. AIDS Patient Care STDS. 2017;31(8):342–347. [PubMed: 28753396]
13. Malebranche DJ, Peterson JL, Fullilove RE, Stackhouse RW. Race and sexual identity: perceptions about medical culture and healthcare among Black men who have sex with men. J Natl Med Assoc. 2004;96(1):97–107. [PubMed: 14746359]
14. Lacefield K, Negy C, Schrader RM, Kuhlman C. Comparing psychosocial correlates of condomless anal sex in HIV-diagnosed and HIV-nondiagnosed men who have sex with men: a

series of meta-analyses of studies from 1993–2013. LGBT Health. 2015;2(3):200–220. [PubMed: 26788669]

15. Traynor SM, Rosen-Metsch L, Feaster DJ. Missed opportunities for HIV testing among STD clinic patients. J Community Health. 2018;43(6):1128–1136. [PubMed: 29796786]
16. Kesler MA, Kaul R, Myers T, et al. Perceived HIV risk, actual sexual HIV risk and willingness to take pre-exposure prophylaxis among men who have sex with men in Toronto, Canada. AIDS Care. 2016;28(11):1378–1385. [PubMed: 27136725]
17. Lockard A, Rosenberg ES, Sullivan PS, et al. Contrasting self-perceived need and guideline-based indication for HIV pre-exposure prophylaxis among young, Black men who have sex with men offered pre-exposure prophylaxis in Atlanta, Georgia. AIDS Patient Care STDS. 2019;33(3):112–119. [PubMed: 30844305]
18. MacKellar DA, Valleroy LA, Secura GM, et al. Perceptions of lifetime risk and actual risk for acquiring HIV among young men who have sex with men. AIDS Behav. 2007;11(2):263–270. [PubMed: 16791527]
19. Schwarcz S, Richards TA, Frank H, et al. Identifying barriers to HIV testing: Personal and contextual factors associated with late HIV testing. AIDS Care. 2011;23(7):892–900. [PubMed: 21424942]
20. Starks TJ, Doyle KM, Shalhav O, John SA, Parsons JT. An examination of gay couples' motivations to use (or forego) pre-exposure prophylaxis expressed during couples HIV testing and counseling (CHTC) sessions. Prev Sci. 2019;20(1):157–167. [PubMed: 29651646]
21. Underhill K, Guthrie KM, Colleran C, Calabrese SK, Operario D, Mayer KH. Temporal fluctuations in behavior, perceived HIV risk, and willingness to use pre-exposure prophylaxis (PrEP). Arch Sex Behav. 2018;47(7):2109–2121. [PubMed: 29327091]
22. Mimiaga MJ, Reisner SL, Bland S, et al. Health system and personal barriers resulting in decreased utilization of HIV and STD testing services among at-risk black men who have sex with men in Massachusetts. AIDS Patient Care STDS. 2009;23(10):825–835. [PubMed: 19803696]
23. Gerend MA, Madkins K, Phillips G 2nd, Mustanski B. Predictors of human papillomavirus vaccination among young men who have sex with men. Sex Transm Dis. 2016;43(3):185–191. [PubMed: 26859806]
24. Gerend MA, Madkins K, Crosby S, et al. A qualitative analysis of young sexual minority men's perspectives on human papillomavirus vaccination. LGBT Health. 2019;6(7):350–356. [PubMed: 31556791]
25. Menza TW, Hughes JP, Celum CL, Golden MR. Prediction of HIV acquisition among men who have sex with men. Sex Transm Dis. 2009;36(9):547–555. [PubMed: 19707108]
26. Smith DK, Pals SL, Herbst JH, Shinde S, Carey JW. Development of a clinical screening index predictive of incident HIV infection among men who have sex with men in the United States. J Acquir Immune Defic Syndr. 2012;60(4):421–427. [PubMed: 22487585]
27. Hoenigl M, Green N, Mehta SR, Little SJ. Risk factors for acute and early HIV infection among men who have sex with men (MSM) in San Diego, 2008 to 2014: A cohort study. Medicine (Baltimore). 2015;94(30):e1242. [PubMed: 26222863]
28. Scott H, Vittinghoff E, Irvin R, et al. Development and validation of the personalized sexual health promotion (SexPro) HIV risk prediction model for men who have sex with men in the United States. AIDS Behav. 2019;24:274–283.
29. Earnshaw VA, Smith LR, Cunningham CO, Copenhaver MM. Intersectionality of internalized HIV stigma and internalized substance use stigma: Implications for depressive symptoms. J Health Psychol. 2015;20(8):1083–1089. [PubMed: 24170015]
30. Quinn K, Dickson-Gomez J, Zarwell M, Pearson B, Lewis M. "A gay man and a doctor are just like, a recipe for destruction": How racism and homonegativity in healthcare settings influence PrEP uptake among young Black MSM. AIDS Behav. 2019;23(7):1951–1963. [PubMed: 30565092]
31. Richens J, Copas A, Sadiq ST, et al. A randomised controlled trial of computer-assisted interviewing in sexual health clinics. Sex Transm Infect. 2010;86(4):310–314. [PubMed: 20551234]

32. Ghanem KG, Hutton HE, Zenilman JM, Zimba R, Erbelding EJ. Audio computer assisted self interview and face to face interview modes in assessing response bias among STD clinic patients. Sex Transm Infect. 2005;81(5):421–425. [PubMed: 16199744]
33. Marcus JL, Hurley LB, Krakower DS, Alexeeff S, Silverberg MJ, Volk JE. Use of electronic health record data and machine learning to identify candidates for HIV pre-exposure prophylaxis: A modelling study. Lancet. HIV 2019.
34. Krakower DS, Gruber S, Hsu K, et al. Development and validation of an automated HIV prediction algorithm to identify candidates for pre-exposure prophylaxis: A modelling study. Lancet. HIV 2019.
35. Balzer LB, Havlir DV, Kamya MR, et al. Machine learning to identify persons at high-risk of HIV acquisition in rural Kenya and Uganda. Clin Infect Dis. 2019.
36. Ventuneac A, John SA, Whitfield THF, Mustanski B, Parsons JT. Preferences for sexual health smartphone app features among gay and bisexual men. AIDS Behav. 2018;22(10):3384–3394. [PubMed: 29948335]
37. Hoth AB, Shafer C, Dillon DB, Mayer R, Walton G, Ohl ME. Iowa TelePrEP: A public-health-partnered telehealth model for HIV pre-exposure prophylaxis (PrEP) delivery in a rural state. Sex Transm Dis. 2019.
38. Stekler JD, McMahan V, Ballinger L, et al. HIV pre-exposure prophylaxis prescribing through telehealth. J Acquir Immune Defic Syndr. 2018;77(5):e40–e42. [PubMed: 29280768]
39. Grov C, Rendina HJ, Patel VV, Kelvin E, Anastos K, Parsons JT. Prevalence of and factors associated with the use of HIV serosorting and other biomedical prevention strategies among men who have sex with men in a US nationwide survey. AIDS Behav. 2018;22(8):2743–2755. [PubMed: 29550942]
40. Stults CB, Grov C, Anastos K, Kelvin EA, Patel VV. Characteristics associated with trust in and disclosure of sexual behavior to primary care providers among gay, bisexual, and other men who have sex with men in the United States. LGBT Health. 2020;7(4):208–213. [PubMed: 32311309]
41. AVAC. PrEP Watch: A snapshot of PrEP scale-up, registration and resources for the United States. 2019; https://www.prepwatch.org/country/united-states/. Accessed November 8, 2019.
42. Gilkey MB, Marcus JL, Garrell JM, Powell VE, Maloney KM, Krakower DS. Using HIV risk prediction tools to identify candidates for pre-exposure prophylaxis: Perspectives from patients and primary care providers. AIDS Patient Care STDS. 2019;33(8):372–378. [PubMed: 31210551]

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Table 1

Demographics, relationship characteristics, sexual HIV transmission risk factors, and substance use and their bivariate associations with the willingness to communicate verbally to assess behavioral characteristics, willingness to communicate via behavioral survey, and willingness in communication methods difference ($n = 4187$)

			Comfort Communicating Verbally (A; Range: 0–4)		Comfort Communicating via Electronic Survey (B; Range: 0–4)		Preference for Communicating via Electronic Survey (B-A)	
Categorical Variables	***n***	***Column %***	***M***	***SD***	***M***	***SD***	***M***	***SD***
Race/ethnicity			$F(3, 4183) = 3.3^{*}$		$F(3, 4183) = 1.9$		$F(3, 4183) = 1.2$	
Black	446	10.7	2.46[ab]	1.54	2.54	1.48	0.08	1.35
Latino	774	18.5	2.44[ab]	1.52	2.63	1.43	0.19	1.38
White	2504	59.8	2.35[a]	1.50	2.55	1.39	0.20	1.40
All other	463	11.1	2.57[b]	1.43	2.69	1.33	0.12	1.33
Education			$F(1, 4185) = 0.4$		$F(1, 4185) = 1.3$		$F(1, 4185) = 3.3^{\dagger}$	
Less than Bachelor's degree	2227	53.2	2.42	1.50	2.56	1.41	0.14	1.37
Bachelor's degree or higher	1960	46.8	2.39	1.50	2.60	1.39	0.22	1.40
Recruitment venue			$F(1, 4185) = 12.7^{***}$		$F(1, 4185) = 0.8$		$F(1, 4185) = 22.8^{***}$	
Online or field (non-clinic setting)	4025	96.1	2.39	1.50	2.58	1.40	0.20	1.39
HIV/STI clinic setting	162	3.9	2.81	1.51	2.48	1.54	−0.33	1.26
Has primary care provider			$F(1, 4185) = 2.2$		$F(1, 4185) = 9.39^{**}$		$F(1, 4185) = 22.24^{***}$	
No	577	13.8	3.32	1.36	3.74	1.25	0.43	1.29
Yes	3610	86.2	3.42	1.52	3.55	1.42	0.13	1.40
Relationship status			$F(1, 4185) = 0.3$		$F(1, 4185) = 0.6$		$F(1, 4185) = 0.0$	
Single	2608	62.3	2.41	1.49	2.59	1.39	0.18	1.39
In relationship with a main partner	1579	37.7	2.39	1.51	2.56	1.41	0.17	1.38
Any male casual sex partners (past 3 months)			$F(1, 4185) = 19.9^{***}$		$F(1, 4185) = 4.7^{*}$		$F(1, 4185) = 6.9^{**}$	
No	963	23.0	2.59	1.47	2.66	1.40	0.07	1.42
Yes	3224	77.0	2.35	1.51	2.55	1.40	0.21	1.37
HIV-status			$F(2, 4184) = 25.2^{***}$		$F(2, 4184) = 1.6$		$F(2, 4184) = 20.5^{***}$	

Categorical Variables	*n*	*Column %*	Comfort Communicating Verbally (A; Range: 0–4) *M*	*SD*	Comfort Communicating via Electronic Survey (B; Range: 0–4) *M*	*SD*	Preference for Communicating via Electronic Survey (B-A) *M*	*SD*
HIV-positive	762	18.2	2.62[a]	1.55	2.58	1.47	−0.05	1.39
HIV-negative, on PrEP[1]	495	11.8	2.70[a]	1.47	2.68	1.42	0.01	1.35
HIV-negative or unknown, not on PrEP	2930	70.0	2.30[b]	1.48	2.56	1.38	0.26	1.38
Prior HIV testing (lifetime)			$F(1, 4185) = 34.1^{***}$		$F(1, 4185) = 7.2^{**}$		$F(1, 4185) = 12.9^{***}$	
No	257	6.1	2.88	1.40	2.35	1.31	0.48	1.46
Yes	3930	93.9	2.44	1.50	2.59	1.41	0.15	1.38
Any substance use (past 3 months)			$F(1, 4185) = 4.4^{*}$		$F(1, 4185) = 0.0$		$F(1, 4185) = 4.5^{*}$	
No	1454	34.7	2.47	1.50	2.58	1.43	0.11	1.44
Yes	2733	65.3	2.37	1.50	2.58	1.39	0.21	1.35
Continuous Variables	*M*	*SD*	*Pearson's r*		*Pearson's r*		*Pearson's r*	
Age	38.3	13.4	−0.01		-0.09^{***}		-0.08^{***}	

Notes:

$^{\dagger}p < 0.10$;

$^{*}p < 0.05$;

$^{**}p < 0.01$;

$^{***}p \leq 0.001$;

[1]PrEP = pre-exposure prophylaxis. Alphabetical subscripts refer to post-hoc comparison significance testing. Percentages may not add up to 100 because of rounding.

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Table 2

Results of fully-adjusted regression models predicting willingness to communicate verbally to assess behavioral characteristics, willingness to communicate via behavioral survey, and willingness in communication methods difference ($n = 4187$)

	Comfort Communicating Verbally (A)		Comfort Communicating via Electronic Survey (B)		Preference for Communicating via Electronic Survey (B-A)	
	B (SE)	***β***	***B (SE)***	***β***	***B (SE)***	***β***
Age	−0.00 (0.00)	−0.03	−0.01 (0.00)***	−0.10	−0.01 (0.00)***	−0.07
Race/ethnicity (Ref: White)						
Black	−0.03 (0.08)	−0.01	−0.08 (0.07)	−0.02	−0.06 (0.07)	−0.01
Latino	0.03 (0.06)	0.01	0.02 (0.06)	0.00	−0.01 (0.06)	−0.00
All other	0.19 (0.08)*	0.04	0.06 (0.07)	0.01	−0.13 (0.07)†	−0.03
Education (Ref: less than Bachelor's degree)						
Bachelor's degree or higher	−0.03 (0.05)	−0.01	0.08 (0.04)†	0.03	0.10 (0.04)*	0.04
Recruitment venue (Ref: HIV/STI clinic setting)						
Non-clinic setting	−0.21 (0.12)†	−0.03	0.19 (0.12)†	0.03	0.40 (0.11)***	0.06
Has primary care provider (Ref: yes)						
No	0.00 (0.07)	0.00	1.66 (0.07)*	0.04	0.17 (0.06)*	0.04
Relationship status (Ref: single)						
In relationship with a main partner	−0.09 (0.05)†	−0.03	−0.03 (0.05)	−0.01	0.06 (0.05)	0.02
Any male casual sex partners (past 3 months; Ref: no)						
Yes	−0.31 (0.06)***	−0.09	−0.15 (0.05)**	−0.04	0.16 (0.05)**	0.05
HIV-status (Ref: HIV-negative, on PrEP)						
HIV-positive	−0.13 (0.09)	−0.03	−0.03 (0.08)	−0.01	0.09 (0.08)	0.03
HIV-negative or unknown, not on PrEP	−0.41 (0.07)***	−0.13	−0.15 (0.07)*	−0.05	0.27 (0.07)***	0.09
Prior HIV testing (lifetime; Ref: Yes)						
No	−0.52 (0.10)***	−0.08	−0.33 (0.09)***	−0.06	0.20 (0.09)*	0.03
Any substance use (past 3 months; Ref: no)						
Yes	−0.12 (0.05)*	−0.04	−0.07 (0.05)	−0.02	0.05 (0.05)	0.02

Notes:

† $p < 0.10$;

* $p < 0.05$;

** $p < 0.01$;

*** $p \leq 0.001$