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Awareness and perceived accuracy of Undetectable = Untransmittable: A cross-sectional analysis with implications for treatment as prevention among young men who have sex with men

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Abstract

The Undetectable = Untransmittable (U=U) campaign was launched in 2016 to simultaneously reduce HIV stigma and raise awareness about treatment as prevention. This research note assesses HIV-negative young men who have sex with men's (YMSM) U=U awareness and perceived accuracy to inform this population's combination HIV prevention strategies.

SHORT SUMMARY

A study of young MSM demonstrated that PrEP engagement was associated with greater awareness and perceived accuracy of Undetectable = Untransmittable, a campaign aiming to educate about HIV treatment as prevention

Keywords

Young gay and bisexual men; condomless anal intercourse; treatment as prevention; HIV prevention campaign; PrEP

INTRODUCTION

The *Undetectable = Untransmittable* (U=U) campaign is an initiative aimed at raising awareness about treatment as prevention (TasP).[1–2] TasP arose from PARTNER Study findings,[3] which demonstrated no incident HIV cases among HIV-negative individuals who engaged in condomless sexual intercourse with an HIV-positive partner with an undetectable viral load (<200 copies/mL).[4–5] U=U was launched in 2016 to dismantle HIV stigma as a barrier to effective, global efforts in HIV treatment and prevention and has since been

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endorsed by prominent health organizations globally.[2] Given its recent rollout, ongoing surveillance of U=U campaign awareness and TasP message acceptability is critical among high-risk populations.

Young men who have sex with men's (YMSM; ages 18-25 years) may benefit from adopting TasP given their disproportionate burden of annual HIV infection in the United States,[6–7] yet few studies have explored YMSM's exposure and understanding of the U=U campaign. Ascertaining TasP beliefs is critical as YMSM have exhibited low rates of condom use and barriers to HIV prevention services (e.g., pre-exposure prophylaxis [PrEP]) in prior studies.[8–9] In this brief report, we describe U=U campaign awareness and perceived message accuracy in a diverse sample of HIV-negative YMSM living in the Mid-Atlantic United States – an area with high HIV prevalence. We also examined whether YMSM's U=U awareness and perceived message accuracy differ across community factors (e.g., perceived HIV stigma, medical mistrust), sexual health promotion behaviors (e.g., HIV testing, PrEP, condomless sex), and sociodemographic characteristics (e.g., age, race/ethnicity, sexual identity, education).

METHODS

Data for this study come from a cross-sectional web-survey examining YMSM's community-level HIV risk across the Mid-Atlantic region. Participants were recruited from Grindr and Facebook (October 2018-February 2019). Eligible participants were cis-gender male, 18-25 years old, self-reported as HIV-negative/unaware, had sex with a man in the past 6 months, and reported a residential zip code along the Philadelphia, Baltimore, or Washington, D.C. metropolitan corridor. After consenting to the study, participants completed a Qualtrics web-survey (~20-30 minutes) and compensated a $10 Amazon gift-card.

To prevent duplicate/falsified entries, we monitored the duplication of email and IP addresses and crosschecked IP addresses with zip codes and residential addresses/cross-streets provided by participants.[10] Of the 1,287 attempted entries, we removed those who did not complete the screener survey (n=585, 45.5%), were ineligible (n=207, 16.1%), consented-but did not initiate the survey (n=112, 8.7%), and duplicate/falsified entries (n=93, 7.2%), which yielded an analytic sample of N=290 YMSM. Twenty-six participants (9.0%) provided incomplete responses and were on average younger ($t_{df=288}$=6.66, p<0.001 and less educated ($\chi^2_{df=1}$=24.37, p<.001) than those who provided complete responses. Employing listwise deletion, our final sample was N=264 YMSM. All data were protected within a University of Pennsylvania firewalled server. Study procedures were reviewed and approved by the University of Pennsylvania Institutional Review Board.

Measures

U=U Awareness and Perceived Message Accuracy.—Participants were asked, "How familiar are you with the Undetectable = Untransmittable (U=U) campaign?" (0=Not at all, 1=A little, 2=Somewhat, 3=Very).[11] Responses were dichotomized to reflect U=U awareness (0=None, 1=Any). U=U aware participants were asked, "With regard to HIV-positive individuals, how accurate do you believe the slogan, Undetectable =

Untransmittable is?" (0=I don't know what "undetectable" means, 1=Completely inaccurate, 2=Somewhat inaccurate; 3=Somewhat accurate, 4=Completely accurate).

Community Factors.—We adapted the 7-item *Perceptions of Local Stigma* scale to measure participants' perceptions of HIV stigma in their neighborhoods (e.g., Most people in my area believe that an HIV-positive person is a sign of personal failure; α=0.87).[12] Items were assessed on a 4-point scale (0=Strongly disagree, 3=Strongly agree). A mean composite score was created, with higher scores indicating greater stigma. Mistrust of healthcare organizations was measured using 7-items (e.g., "Patients have sometimes been deceived or misled by healthcare organizations; α=0.81).[13] Items were assessed on a 4-point scale and averaged together into a composite score where higher scores indicated greater organizational mistrust.

Sexual Health/Risk Behaviors.—Participants reported whether they had engaged in CAI in the prior 3 months (0=None, 1=Any). Participants were also asked a series of PrEP-related questions, which we used to create a PrEP continuum variable[14] (0=PrEP unaware, 1=PrEP aware/no intention, 2=PrEP aware/intend to seek PrEP in the next 3 months, 3=Ever on PrEP). Lastly, participants noted if they had an HIV test in the past 6 months (0=No, 1=Yes).

Sociodemographic Characteristics.—Participants self-reported their age, race/ethnicity, sexual identity, education, and geographic region.

Data Analysis

Using IBM SPSS Statistics (Version 25),[15] we examined U=U awareness by sexual health behaviors and sociodemographic characteristics using unadjusted and multivariable logistic regressions. Variables that were theoretically relevant and statistically significant at $p<0.1$ in the unadjusted models were included in multivariable regressions. Similarly, we assessed differences in perceive message accuracy using bivariate tests (*Pearson's correlation, t-tests, ANOVA)* and multivariable linear regression.

RESULTS

Participants' mean age was 22.44 (*sd*=2.02) years. Over one-third identified as racial/ethnic minorities (*n*=94, 35.6%) and a majority identified as gay, queer, same-gender loving, or homosexual (*n*=213, 80.7%). Most participants reported a college education or higher (*n*=163, 61.7%). Three-quarters of the sample (74.6%; *n*=197) reported recent CAI. 38.6% (*n*=102) reported ever having used PrEP, and 70.1% (*n*=185) tested for HIV in the past 6 months. Mean scores for mistrust of healthcare organizations and perceived HIV stigma were 2.61 (*sd*=0.55) and 2.46 (*sd*=0.56), respectively.

Awareness of U=U Campaign

Most participants (*n*=184, 69.7%) reported U=U campaign awareness. Unadjusted models (Table 1) found U=U awareness was associated with increases in age (*OR*=1.34; 95% CI: 1.17-1.54), having a college education (*OR*=1.74; 95% CI: 1.02-2.96), being on PrEP

(*OR*=2.46; 95% CI: 1.28-4.71), further progression along the PrEP continuum (*OR*=1.98; 95% CI: 1.48, 2.64), and recent HIV testing (*OR*=1.94; 95% CI: 1.11-3.39). Non-gay identified MSM were less likely to be aware of the U=U campaign (*OR*=0.36; 95% CI: 0.19-0.68) compared to gay-identified MSM. No differences were observed by race/ethnicity, geographic region, or recent CAI. In the multivariable model ($\chi^2_{df=7}$=40.11, p<0.001), in addition to age (A*OR*=1.33; 95% CI: 1.10-1.62) and sexual identity's (*OR*=0.45; 95% CI: 0.23-0.92) associations, progressions along the PrEP continuum was associated with increased odds of U=U awareness (*AOR*=1.66; 95% CI: 1.20-2.31).

U=U Perceived Accuracy

Among U=U-aware participants, 4.9% (n=9) rated U=U as completely inaccurate, 13.0% (n=24) as somewhat inaccurate, 42.9% (n=79) as somewhat accurate, 38.0% (n=70) percent as completely accurate, and 1.1% (n=2) indicated that they did not know the meaning of undetectable. Bivariate tests (Table 2) exhibited perceived message accuracy scores were higher among men on PrEP compared to non-PrEP users ($t_{df=180}$=−2.57, p=0.011), college educated compared to men reporting less than a college education ($t_{df=180}$=−4.23, p<0.001), and men who reported a recent HIV test compared to those who did not ($t_{df=180}$=2.31, p=0.022). Perceived message accuracy was also positively correlated with age (r=0.18, p=0.016) and progression along the PrEP continuum (r=0.29, p<0.001). In multivariable analyses (Table 2; $F_{df=7}$=4.69, p<0.001), progression along the PrEP continuum (β=0.24, p=0.002) and having a college education (β=0.27, p=0.001) were associated with increased perceived message accuracy.

DISCUSSION

In this study, approximately 70% of YMSM reported any U=U awareness and, among those aware, over 80% endorsed U=U as somewhat or completely accurate, suggesting high trustworthiness in the U=U campaign messaging. Our analyses implicated the rollout of PrEP as a contributor to U=U campaign awareness and perceived message accuracy, with YMSM further along the PrEP continuum exhibiting greater awareness and endorsement of U=U messaging. It is plausible that YMSM who are further along the PrEP continuum (e.g., men intending to seek PrEP) may be more likely to learn about combination HIV prevention, including resources on TasP as they navigate barriers to PrEP or integrate PrEP into their sexual practices.

Community HIV stigma and mistrust of health organizations was not associated with YMSM's U=U perceived message accuracy. The absence of an association may be attributable to endogeneity bias in our sample, as YMSM who primarily reside within Mid-Atlantic urban centers have greater access to HIV prevention resources, PrEP social marketing campaigns, and other efforts to dispel misinformation about HIV transmission and stigma compared to other regions in the United States (e.g., the South).[16] Consequently, it is imperative to better understand how these relationships manifest in other areas, especially in non-urban regions of the United States where HIV stigma and medical mistrust continue to undermine HIV prevention efforts.[17–18] Given that 70% of our sample reported receiving a recent HIV test, our findings may also indicate high-level capacity-building and

trustworthiness built between HIV prevention service providers and MSM communities within these areas.[19] Lastly, messages like U=U may counter levels of mistrust, eliciting message credibility by emphasizing evidence from clinical trials and enlisting more sex-positive approaches unlike prior HIV campaigns that exploited target audiences' fears and stigmatized STIs.[20]

Our study has notable limitations. First, our U=U perceived accuracy item was offered to campaign-aware participants only. Therefore, we were unable to ascertain U=U-unaware participants' knowledge of TasP. Secondly, our findings do not suggest that U=U is solely responsible for participants' understanding of undetectable HIV. Alternative sources like community networks, HIV-positive partners, or healthcare providers may have been integral to participants' understanding of TasP. Future studies should seek to identify HIV-negative MSM's TasP-related informational resources to inform complementary interventions aiming to increase TasP knowledge. Third, the generalizability of our findings is limited to our sample. Participants were recruited via Facebook and Grindr in Mid-Atlantic metropolitan areas. Low between-group variance provided insufficient statistical power to assess differences by race/ethnicity, which is critical given historical healthcare mistrust and disparities in HIV treatment and prevention that negatively impacts racial/ethnic minorities.[21] Furthermore, the high HIV testing rate in our sample suggests selection bias of YMSM who are highly engaged in healthcare. Finally, though the associations between U=U awareness and age as well as perceived accuracy and education level were strong, our findings were susceptible to Type I error. Excluded participants from incomplete responses were younger and less educated than those in our analytic sample. Replication of our analyses with other community samples of YMSM is warranted.

As U=U aims to counter persisting negative stereotypes of people living with HIV,[22] future studies should assess how TasP campaigns shape YMSM's perceived HIV risk and HIV-stigmatizing attitudes. Since the U=U campaign's aim is to dually combat HIV incidence and stigma through TasP, identifying how to strengthen the U=U's campaign scale-up remains a priority, particularly among YMSM who are skeptical or exhibit stigmatizing attitudes toward people living with HIV. In addition, future studies should seek to monitor how, if at all, TasP has been incorporated into YMSM's HIV repertoires as alternative or combination prevention strategies.

Conclusion

Raising awareness and acceptability of TasP demands a prioritized response to combat ongoing HIV disparities that negatively impact YMSM. Incorporating U=U/TasP content as part of comprehensive sexual health and HIV education may offer opportunities for YMSM to expand their prevention strategies as they navigate their sexualities in adolescence and early adulthood. Lastly, local health organizations who have publicly endorsed U=U and provide services YMSM should capitalize on social media outreach to further disseminate TasP-related messages.

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Table 1.

U=U Awareness among Young Men Who Have Sex with Men in the Mid-Atlantic United States, *N*=264

		Unadjusted Model			Adjusted Model		
Variables	***m* (*sd*) or *n* (%)**	***OR***	***95% CI***	***p***	***AOR***	***95% CI***	***p***
Age	22.44 (2.02)	1.34	1.17-1.54	<0.001	1.33	1.10-1.62	0.004
Race/Ethnicity							
Non-Hispanic, White	170 (64.4)	REF			REF		
Racial/Ethnic Minority	94 (35.6)	0.76	0.44-1.31	0.326	1.16	0.62-2.18	0.650
Sexual Identity							
Gay, Queer, Same-Gender Loving or Homosexual	213 (80.7)	REF			REF		
Other MSM Identity	51 (19.3)	0.36	0.19-0.68	0.002	0.45	0.23-0.92	0.028
PrEP Continuum		1.98	1.48-2.64	<0.001	1.66	1.20-2.31	0.002
PrEP Unaware	15 (5.7)						
PrEP Aware, No Intention to Initiate	103 (39.0)						
PrEP Aware, Intend to Initiate (3 months)	44 (16.7)						
Ever Used PrEP	102 (38.6)						
Education Level							
Less than a College Degree	101 (38.3)	REF			REF		
College Degree or Higher	163 (61.7)	1.74	1.02-2.96	0.043	0.71	0.33-1.52	0.373
Geographic Region							
Washington, D.C.	116 (43.9)	REF					
Philadelphia	101 (38.3)	0.90	0.50-1.63	0.731			
Baltimore	47 (17.8)	0.61	0.30-1.26	0.181			
Condomless Anal Intercourse (past 3 months)							
None	67 (25.4)	REF			REF		
Any	197 (74.6)	1.68	0.94-3.01	0.081	1.01	0.53-1.95	0.972
Recent HIV Test (past 6 months)							
No	79 (29.9)	REF			REF		
Yes	185 (70.1)	1.94	1.11-3.39	0.019	1.12	0.59-2.12	0.739

Table 2.

Multivariable Linear Regression Model for U=U Perceived Accuracy among U=U-Aware Young Men Who Have Sex with Men in the Mid-Atlantic United States, n=182

Variable	*b (se)*	*β*	*p*
Intercept	3.17 (0.94)		0.001
Age	−0.02 (0.04)	−0.04	0.633
Racial/Ethnic Minority	0.01 (0.13)	0.01	0.998
Progression along the PrEP Continuum	0.21 (0.07)	0.24	0.002
College Education or Higher	0.48 (0.15)	0.27	0.001
Received HIV Test in Past 6 Months	0.03 (0.15)	0.02	0.842
Mistrust of Healthcare Organizations	−0.12 (0.11)	−0.08	0.280
Community HIV Stigma	−0.02 (0.11)	−0.02	0.825

Note: Referent Groups – Non-Hispanic, White, Less than High School Education, and No HIV Test in Past 6 Months