

Limited awareness of pre-exposure prophylaxis among black men who have sex with men and transgender women in New York city

Matthew Garnett, Yael Hirsch-Moverman, Julie Franks, Eleanor Hayes-Larson, Wafaa M. El-Sadr & Sharon Mannheimer

To cite this article: Matthew Garnett, Yael Hirsch-Moverman, Julie Franks, Eleanor Hayes-Larson, Wafaa M. El-Sadr & Sharon Mannheimer (2018) Limited awareness of pre-exposure prophylaxis among black men who have sex with men and transgender women in New York city, *AIDS Care*, 30:1, 9-17, DOI: [10.1080/09540121.2017.1363364](https://doi.org/10.1080/09540121.2017.1363364)

To link to this article: <https://doi.org/10.1080/09540121.2017.1363364>



Published online: 09 Aug 2017.



Submit your article to this journal [↗](#)



Article views: 164



View related articles [↗](#)



View Crossmark data [↗](#)



Limited awareness of pre-exposure prophylaxis among black men who have sex with men and transgender women in New York city

Matthew Garnett ^a, Yael Hirsch-Moverman ^{a,b}, Julie Franks ^a, Eleanor Hayes-Larson ^{a,b}, Wafaa M. El-Sadr ^{a,b} and Sharon Mannheimer ^{a,b,c}

^aICAP at Columbia University, Mailman School of Public Health, Columbia University, New York, NY, USA; ^bDepartment of Epidemiology, Mailman School of Public Health, Columbia University, New York, NY, USA; ^cDepartment of Medicine, Division of Infectious Diseases, Harlem Hospital Center, New York, NY, USA

ABSTRACT

Awareness of Pre-exposure prophylaxis (PrEP) was assessed among a cohort of substance-using black men who have sex with men and transgender women (MSM/TGW) participating in the STAR Study, which recruited black MSM/TGW in New York City for HIV testing and linked HIV-infected individuals into care from July 2012 to April 2015. Sociodemographic, psychosocial, known HIV risk factors, and PrEP awareness were assessed among participants. Multivariable logistic regression was conducted to assess factors associated with PrEP awareness. Of 1673 participants, median age was 43 years and 25% were under age 30. Most participants (85.8%) reported having insufficient income for basic necessities at least occasionally, 54.8% were homeless, and 71.3% were unemployed. Awareness of PrEP was reported among 18.2% of participants. PrEP awareness was associated with younger age (adjusted odds ratio [aOR] 0.87, per 5 years), gay identity (aOR 2.46), higher education (aOR 1.70), more frequent past HIV testing (aOR 3.18), less HIV stigma (aOR 0.61), less hazardous/harmful alcohol use (aOR 0.61), and more sexual partners (aOR 1.04, per additional partner in past 30 days). In this substance-using black MSM/TGW cohort with high rates of poverty and homelessness, PrEP awareness was low. This study demonstrates the need for targeted dissemination of PrEP information to key populations to increase awareness and ultimately improve uptake and utilization of PrEP.

ARTICLE HISTORY

Received 6 November 2016
Accepted 26 July 2017

KEYWORDS

HIV prevention; pre-exposure prophylaxis (PrEP); men who have sex with men (MSM); transgender women (TGW)

Introduction

Despite progress in confronting the HIV epidemic in the US, the annual number of new infections has changed little over the past decade (Centers for Disease Control and Prevention, Published November, 2015). While the US National HIV/AIDS Strategy recommends several prevention efforts focused on black men who have sex with men (MSM) (Office of National AIDS Policy, 2010 Jul), this population continues to be overrepresented among new HIV infections (Maulsby et al., 2014). Blacks constitute only 13.9% of the US population, but black males represented 33.2% of adult HIV infections in 2015, more than two thirds of which occurred in black MSM (Centers for Disease Control and Prevention, 2016; U.S. Census Bureau, 2015). While the data are limited, transgender women (TGW) also face disparities with an overall estimated HIV prevalence of 28%, and a 56% prevalence among black TGW (Herbst et al., 2008).

Many factors contribute to high infection rates among black MSM and TGW. One large multicenter study

conducted in six cities in the US found that infrequent HIV testing, undiagnosed HIV infection, and late diagnosis were common among black MSM; and that new HIV diagnoses were more common among infrequent testers, underscoring the need for additional HIV testing and prevention efforts in this group (Mannheimer et al., 2014). A few studies have documented that TGW also have high percentages of undiagnosed HIV and face similar issues to black MSM along the HIV care continuum, from testing to engagement in care and treatment (Schulden et al., 2008; Sevelius, Patouhas, Keatley, & Johnson, 2014).

Daily oral emtricitabine/tenofovir disoproxil fumarate (FTC/TDF or Truvada®), approved for use as pre-exposure prophylaxis (PrEP) for HIV prevention in the US since July 2012, is a potential HIV prevention strategy for at risk groups, including black MSM and TGW. When used consistently, PrEP has been associated with as much as a 92% reduced risk of HIV acquisition in MSM (McCormack et al., 2016; Molina et al., 2015), and has also shown efficacy in heterosexual populations

(Baeten et al., 2012; Thigpen et al., 2012), albeit with conflicting study results (Marrazzo et al., 2015; Van Damme et al., 2012). Mathematical modeling suggests that uptake and adherence to PrEP could lead to a long-term reduction in HIV incidence among MSM (Desai et al., 2008). However, despite its evident promise, major barriers remain to PrEP implementation and scale-up, particularly in populations at high risk.

Knowledge of PrEP has been reported to be low among black MSM and TGW. A study of black MSM in Atlanta, Georgia found that less than 25% of the participants had knowledge of PrEP, with no improvement noted in the 20 months following FDA approval of FTC/TDF for PrEP (Eaton, Driffin, Bauermeister, Smith, & Conway-Washington, 2015). Another study of MSM patients at two New York City sexually transmitted disease (STD) clinics from 2013 to 2014 showed that less than 40% had prior knowledge of PrEP, and none had ever used it (Borges, Westheimer, Edelstein, Golub, & Myers, 2014). Similarly, others have reported low levels of awareness and uptake of PrEP among TGW (Baral et al., 2013).

Studies have also demonstrated the value of informing MSM about PrEP, finding that despite low initial knowledge of and willingness to use PrEP, both improved with the provision of information (Dolezal et al., 2015; Mimiaga, Case, Johnson, Safren, & Mayer, 2009). One study that assessed demographics and levels of interest among MSM and TGW who were offered PrEP as part of routine sexual health services in three US STD clinics found that 60.5% would elect to use it. The study found that the strongest predictors for enrollment and use included prior PrEP awareness and having been self-referred to obtain PrEP information. The study also found that black MSM and TGW were less likely to self-refer, but when adjusted for their lack of prior awareness of PrEP, were just as likely to enroll as other groups (Cohen et al., 2015). Despite these promising findings, data from the 2014 National HIV Behavioral Surveillance System has shown that actual PrEP use remains low across US MSM populations, and that black MSM are half as likely to use it compared to white MSM (Hoots, Finlayson, Nerlander, & Paz-Bailey, 2016).

While some studies have examined the lack of PrEP knowledge among black MSM and TGW, limited data exist on sociodemographic and behavioral factors associated with PrEP awareness among black, substance-using MSM and TGW. In this study, we report the findings from an assessment of PrEP awareness in this group disproportionately impacted by HIV, with the goal of informing the development of future targeted PrEP HIV prevention interventions for this population.

Methods

Data collection

Data were gathered as part of the National Institute on Drug Abuse-funded study, Seek, Test, and Retain (STAR): Linkages for black HIV+, Substance-Using MSM. STAR enrolled participants in New York City from July 2012 to April 2015. The study was approved by the Columbia University Medical Center institutional review board (Ref IRB AAAI1585) and was registered at ClinicalTrials.gov (NCT01790360). All study participants provided written informed consent.

The STAR Study utilized a combination of respondent driven sampling, online advertising, and community-based recruitment in neighborhoods in New York City with high HIV prevalence to enroll the target population for HIV testing (New York City Department of Health and Mental Hygiene, 2015). Inclusion criteria included being a black MSM or TGW, engaging in anal sex with a man in the past year, and reporting any history of alcohol to intoxication or drug use. Data for this analysis were collected using an interviewer-administered questionnaire completed prior to HIV testing. The questionnaire collected information on: sociodemographic characteristics, HIV risk behavior, drug and alcohol use, social support, trust in healthcare providers, feelings of HIV stigma toward others, previous HIV testing history, and awareness of PrEP. The population included in this study was recruited from New York City, where the rate of HIV diagnoses in 2013 was 33.7/100,000 residents, more than twice the rate of the US (13.4/100,000 residents) (Centers for Disease Control and Prevention, Published November 2015; New York City Department of Health and Mental Hygiene, 2015). Participants who indicated that they were HIV-negative or had an unknown HIV status, and reported no prior PrEP use, were included in the current analysis.

Outcome of interest

Awareness of PrEP was ascertained by asking participants “Before today, have you ever heard of PrEP” (Yes/No) prior to testing them for HIV. Before asking the question, participants were given a brief description of PrEP, and were informed that “PrEP (pre-exposure prophylaxis) is when a person is given medicine before they think they might be exposed to HIV, to prevent becoming infected (like when they expect they will be having sex with a partner who may have HIV).” Additionally, participants could ask follow up questions about PrEP and if interested, were given information after completing the study interview and HIV testing.

Correlates of interest

Correlates of interest included sociodemographic characteristics such as age, sex, race, ethnicity, education, employment, relationship status, frequency of not having enough money to cover necessary expenses over the past year, health insurance, and housing status. Scales were adapted from existing validated scales to measure HIV stigma (Visser, Kershaw, Makin, & Forsyth, 2008) and social support (Sherbourne & Stewart, 1991). For HIV stigma, the scale was the mean score of responses to nine questions relating to attitudes of stigma toward people with HIV (e.g., “I feel uncomfortable around people with HIV.”); responses utilized a four-point Likert scale ranging from 1 “strongly disagree” to 4 “strongly agree” (Cronbach’s alpha, 0.86). The social support scale was calculated using the combined mean of eight responses to questions which assessed positive social support in the past 30 days (e.g., “During the last 30 days how often did you have someone to love and make you feel wanted?”) and conflictual interactions

Table 1. Characteristics of participants enrolled in the STAR Study, NYC 07/2012-04/2015^a.

	N = 1673	
	n	%
Awareness of PrEP	304	18.2
Age in years		
18–29	418	25.0
30–39	284	17.0
40–49	544	32.5
50+	427	25.5
Age in years, median (IQR)	43 (30, 50)	
Black	1671	99.9
Hispanic	438	26.2
Transgender	58	3.5
In a relationship	240	14.5
Sexual orientation		
Homosexual	395	23.6
Bisexual	1001	59.9
Other/ Don’t know	57	3.4
Heterosexual	218	13.0
Tested HIV positive at enrollment	110	6.6
Education completed		
Less than high school	491	29.4
High school	783	46.9
More than high school	396	23.7
Current employment status		
Not working	1190	71.3
Working	434	26.0
Student	45	2.7
Insufficient income for necessities		
Never	236	14.2
Occasionally	907	54.4
Frequently	523	31.4
Health insurance (any)	1314	78.5
Household size (median, IQR)	1 (1, 2)	
Homeless	916	54.8
General mistrust in current healthcare providers	164	9.8
HIV stigma scale (median, IQR)	1.8 (1.3, 2.0)	

^aPercents are out of column totals, percents may not sum to 100% due to missing. Missing: insufficient income for necessities (7), current employment status (4), education completed (3), sexual orientation (2), transgender (4), in a relationship (16), Hispanic (1).

during the past 30 days (e.g. “During the past 30 days how much of the time had serious disagreements with your friends about things that were important to you?”); responses utilized a five-point Likert scale ranging from 1 “occurring none of the time” to 5 “occurring all of the time” (Cronbach’s alpha, 0.72).

Alcohol use was assessed using the validated Alcohol Use Disorders Identification Test (AUDIT), in which a score of 8 or greater was considered hazardous/harmful alcohol use (Saunders, Aasland, Babor, de la Fuente, & Grant, 1993) (Cronbach’s alpha, 0.88). The validated Texas Christian University Drug Screen-II (TCUDS-II) was utilized to assess drug use behaviors and attitudes; a score of 3 or more indicates problematic drug use (Simpson, Joe, Knight, Rowan-Szal, & Gray, 2012) (Cronbach’s alpha, 0.92).

Behavioral risk for HIV infection was operationalized as any report of condomless anal sex and/or transactional sex. Participants reported the number of vaginal or anal sex events with any partner in the last month, with and without use of a condom, and were considered to have engaged in condomless sex if they reported any episode of condomless sex. To assess transactional sex, participants were asked if they had given or received money, drugs, or alcohol in exchange for sex with their main and/or casual partners within the past month.

Statistical analysis

Correlates of interest were summarized and compared between those with and without PrEP awareness using Pearson’s χ^2 , Fisher’s exact, and Wilcoxon rank sum tests. Variables that were significant at the 0.20 alpha level were considered for inclusion in a multivariable logistic regression model. A multivariable model was constructed using manual backward model selection. Model fit was examined at the end of model selection with the Hosmer-Lemeshow Goodness-of-Fit test. SAS 9.4 (SAS Institute Inc., Cary, NC) was used for all analyses.

Results

Participant characteristics

Of 1739 participants who enrolled in the STAR Study, 66 were excluded from this analysis: 33 indicated previous use of PrEP, 23 tested HIV-positive in the past, and 10 because of missing data. The remaining 1673 participants who were included in this analysis all reported their HIV status as either uninfected or unknown. Of the 1673 participants, the median age was 43 years (interquartile range 30–50); 25.0% were under the age

of 30, and 110 (6.6%) were found to be HIV-infected at enrollment (Table 1). A minority (3.5%) of participants identified as TGW; the remaining 96.5% were MSM, with 59.9% identifying as bisexual, 23.6% as homosexual, and 13.0% as heterosexual. Most participants (85.8%) reported having insufficient income for basic necessities at least occasionally, 54.8% were homeless, 71.3% were unemployed, 21.5% did not have health insurance, and 29.4% had not graduated from high school. Overall, participants reported low levels of HIV stigma toward others and low levels of healthcare provider mistrust.

PrEP Awareness

Of 1673 participants, 304 (18.2%) reported PrEP awareness. There was a gradual increase in awareness from a level of 15.5% among the 284 participants enrolled in 2012 to 28.3% among the 219 participants enrolled in 2015. In bivariable analysis (Table 2), PrEP awareness was significantly associated with younger age ($p < .001$), being transgender ($p < .001$), identifying as gay ($p < .001$), having a higher education level ($p < .001$), being employed ($p < .001$), having sufficient income ($p = .003$), living in stable housing ($p = .009$), reporting low levels of HIV stigma toward others ($p < .001$), less problematic drug use ($p < .001$), and less hazardous/harmful alcohol use ($p < .001$). Marijuana use with sex within the past month was significantly associated with awareness ($p = 0.008$), but all other drug use with sex within the past month was significantly associated with lack of PrEP awareness ($p = 0.025$). PrEP awareness was not significantly related to any sexual risk factors. Participants who had been tested for HIV in their lifetime and those testing at least once in the past year were more likely to indicate PrEP awareness ($p < 0.001$ for both).

In multivariable analysis, as shown in Table 3, PrEP awareness was independently associated with identifying as gay compared to heterosexual (adjusted odds ratio [aOR] 2.5, 95% confidence interval [CI]: 1.4–4.3), identifying as “unknown” or “other” sexual orientation compared to heterosexual (aOR 2.9, 95% CI: 1.2–6.7), and having more than a high school education compared to less than a high school education (aOR 1.7, 95% CI: 1.1–2.6). For each additional sexual partner reported, the odds of PrEP awareness increased by 4% (aOR 1.0, 95% CI: 1.0–1.1). The number of HIV tests reported in the prior year was associated with PrEP awareness (aOR 1.8, 95% CI: 1.2–2.6 for one HIV test, and aOR 3.2, 95% CI: 2.2–4.7 for getting HIV tested >2 times, both compared to no tests in the past year). Hazardous/harmful alcohol use (aOR 0.6, 95% CI: 0.5–0.8), reporting high levels of HIV stigma toward others

(aOR 0.6, 95% CI: 0.4–0.9), and every five years of older age (aOR 0.9, 95% CI: 0.9–0.9) were associated with lack of PrEP awareness. There was no evidence of poor model fit using the Hosmer-Lemeshow Goodness-of-Fit test.

Discussion

This study demonstrated low PrEP awareness of 18% among a cohort of black MSM and TGW recruited from July 2012 through April 2015 in a high HIV prevalence area of the US. This low awareness is underscored by the high rate of new HIV diagnoses (6.6%) found among study participants. Even when participants who reported prior PrEP use are included ($n = 33$), only 20% of total participants had an awareness of PrEP at study enrollment. This is lower than other published data from the same time period, with studies showing that 39% of black MSM and TGW and 59% of all sampled MSM and TGW populations were aware of PrEP (Cohen et al., 2015; Eaton et al., 2017). PrEP has been FDA-approved in the US for five years and despite a slow initial uptake, recent data show an increase in PrEP prescribing for US MSM (Eaton et al., 2015; Laufer, O’Connell, Feldman, & Zucker, 2015). However, despite a modest increase in PrEP use noted in the literature, awareness remains low in some populations at substantial risk for HIV, which could weaken the overall impact of PrEP use (Eaton et al., 2015).

Participants in this study who identified as gay (24% of the cohort) and those who reported more sexual partners were more likely to be aware of PrEP. Participants who identified as gay could have more interaction with the various sources of PrEP information, including social networks, gay friendly venues, and gay-identified literature or media. Those with multiple partners may be aware of their risk for HIV infection and thus may have sought information regarding PrEP. It is also possible that those with more sexual partners may have had more opportunities to encounter information about PrEP either through their partners or expanded social networks. Importantly, other behaviors associated with increased risk of HIV infection, such as having unprotected anal sex, transactional sex, or having an HIV-positive partner, were not associated with PrEP awareness. These findings indicate that only a minority of this population at substantial risk of HIV were aware of PrEP, which highlights the need for intensified outreach and education beyond traditional gay venues to reach all MSM and TGW populations who would benefit from PrEP.

Hazardous/harmful alcohol use was significantly associated with low PrEP awareness. Other indicators

Table 2. Awareness of PrEP among participants enrolled in the STAR Study, NYC 07/2012-04/2015: unadjusted analysis^a.

	Yes		No		P-value ^c
	N = 304		N = 1369		
	n	%	n	%	
Participant demographics ^b					
Age in years, median (IQR)	32 (23, 45.5)		44 (32, 50)		<.001*
Hispanic	91	30.0	347	25.3	0.093
Transgender	21	7.0	37	2.7	<.001*
In a relationship	47	15.5	193	14.3	0.574
Sexual orientation					
Homosexual	120	39.5	275	20.1	<.001*
Bisexual	138	45.4	863	63.1	
Other/ Don't know	18	5.9	39	2.9	
Heterosexual	28	9.2	190	13.9	
Education completed					
Less than high school	79	26.0	412	30.2	<.001*
High school	121	39.8	662	48.5	
More than high school	104	34.2	292	21.4	
Current employment status					
Not working	184	60.7	1006	73.6	<.001*
Working	109	36.0	325	23.8	
Student	10	3.3	35	2.6	
Insufficient income for necessities					
Never	49	16.2	187	13.7	0.003*
Occasionally	184	60.7	723	53.0	
Frequently	70	23.1	453	33.2	
Health insurance (any)	238	78.3	1076	78.6	0.905
Homeless	146	48.0	770	56.2	0.009*
Substance use risk factors					
Hazardous/harmful alcohol use (AUDIT) ^d	113	38.4	667	50.8	<.001*
Alcohol use with sex in past 30 days	173	56.9	820	59.9	0.337
Marijuana with sex in past 30 days	135	44.4	497	36.3	0.008*
Drugs with sex in past 30 days (ex: marijuana)	103	33.9	559	40.8	0.025*
Injection drug use ever					
Current injection drug use	21	6.9	81	5.9	0.509
Shared needles	12	3.9	36	2.6	0.252
Yearly problematic drug use (TCUDS-II) ^e	144	48.8	808	60.8	<.001*
Sexual risk factors					
Any unprotected sex in past month	185	60.9	873	63.8	0.318
Any unprotected anal sex in past month	170	55.9	753	55.0	0.810
Any transactional sex in past month ^f	94	30.9	473	34.6	0.226
Total number of partners (median, IQR)	2 (1, 3)		2 (1, 3)		0.106
Main partner					
No main partner	142	46.7	609	44.5	0.165
1 Main partner	156	51.3	702	51.3	
2 Concurrent main partners	6	2.0	58	4.3	
At least one main partner is male	140	46.1	577	42.2	0.213
Main partner HIV status					
Negative	98	32.2	400	29.2	0.155
Positive/Unknown	64	21.1	360	26.3	
No partner	142	46.7	609	44.5	
One or more casual partners	187	61.5	824	60.2	0.680
Testing history					
Never tested for HIV	14	4.6	160	11.7	<.001*
# of HIV tests in past year					
None	69	22.7	587	42.9	<.001*
1	104	34.2	482	35.2	
2+	131	43.1	300	21.9	
Other					
Social support scale (median, IQR) ^g	2.1	1.5–2.8	2.0	1.5–2.5	0.074
HIV stigma scale (median, IQR) ^h	1.4 (1.1, 2)		1.8 (1.3, 2)		<.001*
General mistrust in current healthcare providers	30	9.9	134	9.8	0.994

^a76 Participants were excluded from the analysis for indicating previous PrEP use, testing HIV positive in the past, or not answering the HIV prevention strategies questions.

^bPercents are out of column totals, percents may not sum to 100% due to missing.

^cP-values are rank sum or chisq unless otherwise noted, asterisk denotes significant p-value at the .05 level.

^dBased on the validated AUDIT score greater than or equal to 8.

^eBased on the validated TCUDS-II drug scale, a score of 3 or more indicates problematic use.

^fAssumes all missing (due to not being sexually active/ not having partners of any type) as "no".

^gScale is of mean scores where 1 is none of the time and 5 is all of the time.

^hBased on a scale of 1 to 4 where 4 endorses more stigma.

Table 3. Multivariable logistic regression analysis of factors associated with awareness of PrEP, among participants enrolled in the STAR Study, NYC 07/2012-04/2015.

Variable ^a	Regression coefficient	Standard error	Adjusted OR	95% CI	P-value
Age (per 5 years)*	-0.135	0.007	0.87	0.86–0.88	<.0001
Hispanic	0.155	0.173	1.17	0.83–1.64	0.371
<i>Sexual orientation</i>					
Homosexual*	0.899	0.281	2.46	1.42–4.26	0.001
Bisexual	0.113	0.269	1.12	0.66–1.90	0.675
Other/ Don't know*	1.050	0.435	2.86	1.22–6.70	0.016
Heterosexual	Ref	–	–	–	–
<i>Education completed</i>					
Less than high school	Ref	–	–	–	–
High school	0.055	0.191	1.06	0.73–1.54	0.775
More than high school*	0.530	0.209	1.70	1.13–2.56	0.011
HIV stigma*	-0.489	0.171	0.61	0.44–0.86	0.004
<i>Number of HIV tests in past year</i>					
None	Ref	–	–	–	–
1*	0.567	0.195	1.76	1.20–2.58	0.004
2+*	1.158	0.198	3.18	2.16–4.69	<.0001
Hazardous/harmful alcohol use*	-0.492	0.158	0.61	0.45–0.83	0.002
Total number of partners*	0.040	0.016	1.04	1.01–1.07	0.0111

^aAsterisk denotes significance at the .05 level.

of drug use, including injection drug use, assessed among this cohort of substance-using black MSM and TGW with high rates of poverty and homelessness, were not associated with PrEP awareness. The low awareness of PrEP by respondents who reported hazardous/harmful alcohol use suggests that information regarding PrEP is not reaching this group, and that different outreach methods may be necessary.

Analyses showed that prior HIV testing was associated with PrEP awareness. Individuals who had at least one HIV test in the past year were almost twice as likely to be aware of PrEP, and those who tested at least twice in the past year had a more than three-fold higher likelihood of PrEP awareness in comparison to those not tested in the past year. This may have been due to information received at testing sites, or that those who get more frequent HIV tests were more aware of the risk of HIV acquisition and methods to prevent it, including PrEP.

Individuals who reported lower levels of externalized stigma toward HIV-infected individuals were also more likely to be aware of PrEP. Low or no feelings of HIV stigmatization may relate to a broader knowledge of HIV, as also suggested by the significant association of HIV testing frequency and PrEP awareness. Those who indicated lower levels of stigma about HIV may also be more likely to seek out HIV-related services and information, while those with higher levels of stigma may avoid seeking or receiving HIV prevention education. This phenomenon has been demonstrated in prior research with HIV testing, where people who express lower levels of stigma have been shown to be more likely to have sought HIV testing (Kalichman & Simbayi, 2003).

Formal educational attainment was significantly associated with PrEP awareness. Participants with more than a high school education were almost twice

as likely to be aware of PrEP as those with less than a high school education. Prior studies have similarly shown that individuals with more education were more likely to have greater knowledge of sexually transmitted diseases and sexually transmitted disease prevention (Garofalo et al., 2015). These findings are underscored by the overall low levels of educational attainment among the majority of this group. Even among the 24% of study participants that had education beyond high school, only 26% of this group had heard about PrEP. Although this group shows more knowledge than participants with a high school education (15.5%) and those with less than a high school education (16.1%), it remains at a low level. While educational venues remain potential areas of intervention, they may not be the best way to educate this particular group of black MSM and TGW about PrEP.

Increasing PrEP awareness is an important goal for HIV prevention, and this analysis shows that there are disparities in awareness within this high risk population. Low awareness was associated with being older and reporting hazardous alcohol use while greater awareness was seen among participants who self identified as gay, had multiple partners within the past month, had sought testing in the past year, and had low feelings of stigma towards HIV, findings that are consistent with another major study of black MSM and TGW (Eaton et al., 2017). Although each of these characteristics was independently associated with higher awareness, there may be confounding elements that drive these associations. Although not fully assessed in this study, involvement with a larger gay community, or an openness about behaviors and personal willingness to seek out information could potentially play a role in this increased awareness. Further research is needed to explore these

possibilities of social connectedness, or personal behaviors that influence health care knowledge and broader HIV prevention knowledge.

The non-significance of many of the high-risk behaviors is notable. Those who reported high risk behaviors were not more aware of PrEP, which illustrates that PrEP information is not reaching populations at high risk. Findings suggest that specific risk factors do not necessarily translate into differential levels of PrEP awareness, and further research to understand this relationship of risk perception is important. Increasing awareness and eventual uptake of PrEP among these subgroups, such as IV drug users and persons engaging in unprotected sex, could be beneficial in terms of decreasing HIV incidence among these groups.

This study has some limitations. First, the lack of measurement of perceived HIV risk prevents us from making conclusions about its role in determining PrEP awareness. Additionally, the data were collected through self-report via in-person interviews, so responses may have been subject to social desirability bias. Our study is cross-sectional and thus cannot determine causality of PrEP awareness, but our description of correlates nonetheless allows for identification of sub-groups that would benefit from additional outreach. Also, despite the inclusion of both black MSM and TGW in the study, the number of TGW was small, and therefore our ability to make specific recommendations about this population is limited.

The study also has several strengths. It included a very large number of substance-using black MSM and TGW, a population at high risk of HIV infection, in a geographic setting that remains an epicenter for HIV infection in the US (Centers for Disease Control and Prevention, Published November 2015). The cohort in this study, with high rates of poverty, unemployment, and lack of health insurance, reflect the disparities identified as contributing to the disproportionate rate of HIV among black MSM and TGW in the US (Beer, Oster, Mattson, Skarbinski, & Medical Monitoring Project, 2014; Mayer et al., 2014; Moore, 2011; Sullivan et al., 2014). Furthermore, this cohort was recruited from New York City, a high HIV prevalence area, and over 6% of those tested were diagnosed as HIV-infected. The mixed recruitment methods were also a valuable strength of the study, allowing for enrollment of a large and diverse sample. This study adds to the limited literature on PrEP implementation and HIV prevention among black MSM and TGW.

Conclusion

Awareness of PrEP (or lack thereof) must be taken into account when implementing PrEP programs. The low

level of PrEP awareness in conjunction with the high percentage of participants who were diagnosed as HIV-infected (6.6%) in this study highlights the need for greater dissemination of PrEP information and education to populations at high risk. Black MSM and TGW account for a disproportionately large number of newly acquired HIV cases in the US, thus prevention tailored to this group is essential to decreasing HIV incidence. This analysis identified certain subgroups of this population as having lower PrEP awareness, including those who did not identify as gay, were older, had hazardous/harmful alcohol use, had greater feelings of stigma toward others with HIV, and had infrequent prior HIV testing. Our results suggest that additional efforts to improve PrEP awareness in this population heavily impacted by HIV may require moving beyond traditional gay venues and healthcare settings, such as to broadly targeted social media and ad campaigns.

Disclosure statement

No potential conflict of interest was reported by the authors.

Funding

This research was supported by the National Institute on Drug Abuse: "Seek, Test, and Retain: Linkages for Black HIV+, Substance Using MSM" under [grant number R01DA032100].

ORCID

Matthew Garnett  <http://orcid.org/0000-0002-1867-6856>

Yael Hirsch-Moverman  <http://orcid.org/0000-0003-0096-1306>

Julie Franks  <http://orcid.org/0000-0001-6329-2301>

Wafaa M. El-Sadr  <http://orcid.org/0000-0003-3735-9781>

References

- Baeten, J. M., Donnell, D., Ndase, P., Mugo, N. R., Campbell, J. D., Wangisi, J., ... Partners Pr, E. P. S. T. (2012). Antiretroviral prophylaxis for HIV prevention in heterosexual men and women. *New England Journal of Medicine*, 367 (5), 399–410. doi:10.1056/NEJMoa1108524
- Baral, S. D., Poteat, T., Stromdahl, S., Wirtz, A. L., Guadamuz, T. E., & Beyrer, C. (2013). Worldwide burden of HIV in transgender women: A systematic review and meta-analysis. *The Lancet Infectious Diseases*, 13(3), 214–222. doi:10.1016/S1473-3099(12)70315-8
- Beer, L., Oster, A. M., Mattson, C. L., Skarbinski, J., & Medical Monitoring Project. (2014). Disparities in HIV transmission risk among HIV-infected black and white men who have sex with men, United States, 2009. *Aids (London, England)*, 28 (1), 105–114. doi:10.1097/QAD.0000000000000021
- Borges, C., Westheimer, E., Edelstein, Z., Golub, S., & Myers, J. (2014). *Limited knowledge, but high interest in HIV Pre-exposure prophylaxis among patients attending New York*

- city health department STD clinics, 2013–2014. Paper presented at the STD prevention conference. Retrieved November 21, 2015, from <https://cdc.confex.com/cdc/std2014/webprogram/Paper35901.html>
- Centers for Disease Control and Prevention. (2015, November). *HIV Surveillance Report, 2014*. Retrieved June 13, 2016, from <http://www.cdc.gov/hiv/library/reports/surveillance/>
- Centers for Disease Control and Prevention. (2016). *Epidemiology of HIV infection through 2015*. Retrieved May 28, 2017, from <https://www.cdc.gov/hiv/pdf/library/slidesets/cdc-hiv-surveillance-genepi.pdf>
- Cohen, S. E., Vittinghoff, E., Bacon, O., Doblecki-Lewis, S., Postle, B. S., Feaster, D. J., ... Liu, A. Y. (2015). High interest in preexposure prophylaxis among men who have sex with men at risk for HIV infection: Baseline data from the US PrEP demonstration project. *JAIDS Journal of Acquired Immune Deficiency Syndromes*, 68(4), 439–448. doi:10.1097/QAI.0000000000000479
- Desai, K., Sansom, S. L., Ackers, M. L., Stewart, S. R., Hall, H. I., Hu, D. J., ... McElroy, P. D. (2008). Modeling the impact of HIV chemoprophylaxis strategies among men who have sex with men in the United States: HIV infections prevented and cost-effectiveness. *Aids (London, England)*, 22(14), 1829–1839. doi:10.1097/QAD.0b013e32830e00f5
- Dolezal, C., Frasca, T., Giguere, R., Ibitoye, M., Cranston, R. D., Febo, I., ... Carballo-Dieguez, A. (2015). Awareness of post-exposure prophylaxis (PEP) and pre-exposure prophylaxis (PrEP) is low but interest is high among men engaging in condomless anal sex with men in Boston, Pittsburgh, and San Juan. *AIDS Education and Prevention*, 27(4), 289–297. doi:10.1521/aeap.2015.27.4.289
- Eaton, L. A., Driffin, D. D., Bauermeister, J., Smith, H., & Conway-Washington, C. (2015). Minimal awareness and stalled uptake of pre-exposure prophylaxis (PrEP) among at risk, HIV-negative, black men who have sex with men. *AIDS Patient Care and STDs*, 29(8), 423–429. doi:10.1089/apc.2014.0303
- Eaton, L. A., Matthews, D. D., Driffin, D. D., Bukowski, L., Wilson, P. A., Stall, R. D., & Team, P. S. (2017). A multi-city assessment of awareness and uptake of pre-exposure prophylaxis (PrEP) for HIV prevention among black men and transgender women who have sex with men. *Prevention Science*. doi:10.1007/s11121-017-0756-6
- Garofalo, R., Gayles, T., Bottone, P. D., Ryan, D., Kuhns, L. M., & Mustanski, B. (2015). Racial/ethnic difference in HIV-related knowledge among young men who have sex with men and their association with condom errors. *Health Education Journal*, 74(5), 518–530. doi:10.1177/0017896914549485
- Herbst, J. H., Jacobs, E. D., Finlayson, T. J., McKleroy, V. S., Neumann, M. S., Crepaz, N., & Team, H. A. P. R. S. (2008). Estimating HIV prevalence and risk behaviors of transgender persons in the United States: A systematic review. *AIDS and Behavior*, 12(1), 1–17. doi:10.1007/s10461-007-9299-3
- Hoots, B. E., Finlayson, T., Nerlander, L., Paz-Bailey, G., & National, H. I. V. B. S. S. G. (2016). Willingness to take, use of, and indications for pre-exposure prophylaxis among men who have sex with men—20 US cities, 2014. *Clinical Infectious Diseases*, 63(5), 672–677. doi:10.1093/cid/ciw367
- Kalichman, S. C., & Simbayi, L. C. (2003). HIV testing attitudes, AIDS stigma, and voluntary HIV counselling and testing in a black township in Cape Town, South Africa. *Sexually Transmitted Infections*, 79(6), 442–447.
- Laufer, F. N., O'Connell, D. A., Feldman, I., & Zucker, H. A. (2015). Vital signs: Increased Medicaid prescriptions for pre-exposure prophylaxis against HIV infection—New York, 2012–2015. *MMWR. Morbidity and Mortality Weekly Report*, 64(46), 1296–1301. doi:10.15585/mmwr.mm6446a5
- Mannheimer, S. B., Wang, L., Wilton, L., Van Tieu, H., Del Rio, C., Buchbinder, S., ... Mayer, K. H. (2014). Infrequent HIV testing and late HIV diagnosis are common among a cohort of black men who have sex with men in 6 US cities. *JAIDS Journal of Acquired Immune Deficiency Syndromes*, 67(4), 438–445. doi:10.1097/QAI.0000000000000334
- Marrazzo, J. M., Ramjee, G., Richardson, B. A., Gomez, K., Mgodhi, N., Nair, G., ... Team, V. S. (2015). Tenofovir-based preexposure prophylaxis for HIV infection among African women. *New England Journal of Medicine*, 372(6), 509–518. doi:10.1056/NEJMoa1402269
- Maulsby, C., Millett, G., Lindsey, K., Kelley, R., Johnson, K., Montoya, D., & Holtgrave, D. (2014). HIV among black men who have sex with men (MSM) in the United States: A review of the literature. *AIDS and Behavior*, 18(1), 10–25. doi:10.1007/s10461-013-0476-2
- Mayer, K. H., Wang, L., Koblin, B., Mannheimer, S., Magnus, M., del Rio, C., ... Team, H. P. (2014). Concomitant socioeconomic, behavioral, and biological factors associated with the disproportionate HIV infection burden among black men who have sex with men in 6 U.S. Cities. *PLoS One*, 9(1), e87298. doi:10.1371/journal.pone.0087298
- McCormack, S., Dunn, D. T., Desai, M., Dolling, D. I., Gafos, M., Gilson, R., ... Gill, O. N. (2016). Pre-exposure prophylaxis to prevent the acquisition of HIV-1 infection (PROUD): effectiveness results from the pilot phase of a pragmatic open-label randomised trial. *The Lancet*, 387(10013), 53–60. doi:10.1016/S0140-6736(15)00056-2
- Mimiaga, M. J., Case, P., Johnson, C. V., Safren, S. A., & Mayer, K. H. (2009). Preexposure antiretroviral prophylaxis attitudes in high-risk Boston area men who report having sex with men: Limited knowledge and experience but potential for increased utilization after education. *JAIDS Journal of Acquired Immune Deficiency Syndromes*, 50(1), 77–83. doi:10.1097/QAI.0b013e31818d5a27
- Molina, J. M., Capitant, C., Spire, B., Pialoux, G., Cotte, L., Charreau, I., ... Group, A. I. S. (2015). On-demand pre-exposure prophylaxis in men at high risk for HIV-1 infection. *New England Journal of Medicine*, 373(23), 2237–2246. doi:10.1056/NEJMoa1506273
- Moore, R. D. (2011). Epidemiology of HIV infection in the United States: Implications for linkage to care. *Clinical Infectious Diseases*, 52(Suppl. 2), S208–S213. doi:10.1093/cid/ciq044
- New York City Department of Health and Mental Hygiene. (2015). *New York City HIV/AIDS annual surveillance statistics: New York*. Retrieved December 14, 2015, from <http://www.nyc.gov/html/doh/downloads/pdf/ah/surveillance2013-table-all.pdf>
- Office of National AIDS Policy. (2010, July). *National HIV/AIDS strategy for the United States updated to 2020*. Retrieved July 18, 2016, from <https://www.aids.gov/federal-resources/national-hiv-aids-strategy/nhas-update.pdf>

- Saunders, J. B., Aasland, O. G., Babor, T. F., de la Fuente, J. R., & Grant, M. (1993). Development of the alcohol use disorders identification test (AUDIT): WHO collaborative project on early detection of persons with harmful alcohol consumption--II. *Addiction*, 88(6), 791–804.
- Schulden, J. D., Song, B., Barros, A., Mares-DelGrasso, A., Martin, C. W., Ramirez, R., ... Heffelfinger, J. D. (2008). Rapid HIV testing in transgender communities by community-based organizations in three cities. *Public Health Reports*, 123(Suppl. 3), 101–114.
- Sevelius, J. M., Patouhas, E., Keatley, J. G., & Johnson, M. O. (2014). Barriers and facilitators to engagement and retention in care among transgender women living with human immunodeficiency virus. *Annals of Behavioral Medicine*, 47(1), 5–16. doi:10.1007/s12160-013-9565-8
- Sherbourne, C. D., & Stewart, A. L. (1991). The MOS social support survey. *Social Science & Medicine*, 32(6), 705–714.
- Simpson, D. D., Joe, G. W., Knight, K., Rowan-Szal, G. A., & Gray, J. S. (2012). Texas christian university (TCU) short forms for assessing client needs and functioning in addiction treatment. *Journal of Offender Rehabilitation*, 51(1-2), 34–56. doi:10.1080/10509674.2012.633024
- Sullivan, P. S., Peterson, J., Rosenberg, E. S., Kelley, C. F., Cooper, H., Vaughan, A., ... Sanchez, T. H. (2014). Understanding racial HIV/STI disparities in black and white men who have sex with men: A multilevel approach. *PLoS One*, 9(3), e90514. doi:10.1371/journal.pone.0090514
- Thigpen, M. C., Kebaabetswe, P. M., Paxton, L. A., Smith, D. K., Rose, C. E., Segolodi, T. M., ... Group, T. D. F. S. (2012). Antiretroviral preexposure prophylaxis for heterosexual HIV transmission in Botswana. *New England Journal of Medicine*, 367(5), 423–434. doi:10.1056/NEJMoa1110711
- U.S. Census Bureau. (2015). *American community survey 1-year estimates*. Retrieved June 26, 2017, from https://factfinder.census.gov/faces/nav/jsf/pages/download_center.xhtml
- Van Damme, L., Corneli, A., Ahmed, K., Agot, K., Lombaard, J., Kapiga, S., ... Group, F. E.-P. S. (2012). Preexposure prophylaxis for HIV infection among african women. *New England Journal of Medicine*, 367(5), 411–422. doi:10.1056/NEJMoa1202614
- Visser, M. J., Kershaw, T., Makin, J. D., & Forsyth, B. W. (2008). Development of parallel scales to measure HIV-related stigma. *AIDS and Behavior*, 12(5), 759–771. doi:10.1007/s10461-008-9363-7