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ORIGINAL PAPER

Community Levels of PrEP Use Among Men Who Have Sex with Men by Race/Ethnicity, San Francisco, 2017

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Abstract

Efforts in San Francisco are maximizing the use of pre-exposure prophylaxis (PrEP) among men who have sex with men (MSM) where high levels of use are needed to maximize reducing new HIV infections. National HIV Behavioral Surveillance surveys MSM in San Francisco. Demographics, health care and risk behaviors are assessed. PrEP use is measured for 12 month, 6 month and 30 day periods. Of 399 HIV uninfected men sampled in 2017, 43.4% used PrEP in the past 12 months. Proportions of men using PrEP by race/ethnicity were not significant at any time point. Decreases between 6 month and 30 day use were highest among African American and Latino men. These men had the highest proportion of intermittent use in the past 30 days but not significantly. While our data suggest the disparity in PrEP use by race/ethnicity has narrowed in San Francisco, novel delivery of PrEP may narrow disparity further.

Keywords Men who have sex with men · Race/ethnicity · Pre-exposure prophylaxis · Disparities

Introduction

Pre-exposure prophylaxis (PrEP) shows great promise to prevent HIV infection for individuals and to help eliminate transmission if high coverage can be achieved in the populations most at risk [1]. Men who have sex with men (MSM) experience the largest number of new HIV infections in the United States [2]. Efforts have been underway in many US cities, including San Francisco, to maximize the use of PrEP among MSM, particularly among men of color who currently and historically have had higher burden of HIV disease and disproportionate numbers of new infections [2–5]. Moreover, the literature suggests that between 30 and 50% of a community must be using PrEP to achieve its maximum effect on reducing new HIV infections [6–8]. To determine progress towards the goals of increased PrEP use among men of color and sustained levels of community PrEP use we examine various indicators/measures of PrEP use among MSM by race/ethnicity in San Francisco in 2017.

Methods

We examined data collected in 2017 for the National HIV Behavioral Surveillance (NHBS) survey among MSM in San Francisco. NHBS employs time-location sampling (TLS) to achieve community-based recruitment of MSM. Details have been previously published [9, 10]. Briefly, a formative phase establishes a list of venues, days and times (VDTs) where MSM can be found. Each month during data collection a random selection of VDTs is made. Staff attend the venue at the specified day and time and systematically intercept, screen, obtain verbal consent and complete behavioral surveys and HIV testing.

Questions assessed ever-PrEP use over varying time periods in the recent past, and degree of recent adherence among those who were using PrEP. PrEP use was assessed with yes/no questions referring to any use in the past 12 months and past 6 months. PrEP use in the past 30 days was assessed with a scale: every day, almost every day or less often. Men who did not use PrEP in the past 30 days were not asked this

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question and were thus not included in the intermittent use group. We focused our analysis of the last 30 days on men who reported use every day (complete adherence) and those who used PrEP less than every day (intermittent adherence). Note that without exact PrEP initiation and discontinuation dates we were unable to determine how many men were classified as intermittent users because of recent initiation. Finally our choice of everyday versus not every day use is based on current CDC guidelines that emphasize daily dosing [11]. However we acknowledge the evidence that intermittent and on-demand dosing is effective [12, 13]. We examined the frequency of each of these PrEP use metrics stratified by participants' race/ethnicity. To assess change in recent sustained use we calculated the drop-off between ever-PrEP users (as measured by any PrEP use in the last 6 months) and everyday PrEP users within each racial/ethnic group.

Standard demographic information was collected including age, race/ethnicity, educational attainment, income and dependents (i.e., "living wage"), current health insurance status, having a regular source of health care, and having visited a doctor in the past 12 months. We applied a previously developed calculator to classify participants by living wage based on reported income and number of dependents [14]. We chose to use living wage rather than poverty as our stratifying variable as federal poverty guidelines do not take into account the geographic variability in cost of living, which is high in the San Francisco Bay Area.

We assessed sexual behavior and partner-level characteristics by asking a series of questions about the last five partners in the past 6 months. These included each partner's HIV serostatus, and the number of acts of condomless insertive and condomless receptive anal intercourse. STI history was assessed by asking if they were diagnosed by a health care provider with gonorrhea, chlamydia or syphilis in the past 12 months. Tabulations and bivariate analyses using χ^2 or Fisher exact tests were performed in SAS 9.4. Of note, we used row percents to more clearly report changes in PrEP use within each recall period based on the responses from all HIV-negative MSM. Row percents also allow for estimations of changes in PrEP use across recall periods. The NHBS protocol was reviewed and approved by the IRB of the University of California San Francisco.

Results

A total of 508 MSM were recruited; of these, 399 self-reported as not being HIV infected. These participants were potentially eligible for PrEP and were included in further analysis. Of the 399 men, 173 (43.4%) reported using PrEP in the past 12 months (Table 1).

Figure 1 shows the four PrEP use indicators by race/ethnicity. Differences in the proportion of men using PrEP stratified by race/ethnicity were not statistically significant at each time point. We do note that Black/African American and Latino men have the largest change in community level use in the past 6 months and use every day in the past 30 days. The decreases between 6 month and 30 day use were 16.6% for Black/African American and 19.4% for Latino men compared to decreases of 10.6–12.7% among the other race/ethnicity groups (although these differences did not reach statistical significance). Finally, Black/African American (16.7%) and Latino (20.4%) men had the highest proportion of intermittent use in the past 30 days compared to 10.5–14.3% in the other groups but not significantly so.

There were few demographic differences in terms of using and not using PrEP in the past 12 months with the exception of age and having visited a doctor in the past 12 months. Higher proportions of 25–34 year-old (51.3%) and 35–44 year-old (61.5%) men were using PrEP than those in the younger (18–24 years, 45.7%) and older (45–54 years, 36.0%, and 55 and above, 10.5%) age groups (χ^2 45.9, $p < 0.001$). The patterns of use in the past 6 months, 30 days (every day) and 30 days (less than every day) varied little compared to use in the past 12 months. However, the use of PrEP by age strata slightly differed in PrEP use in the past 30 days, less than every day. In this case, higher proportions of 18–24 year old (22.9%) and 25–34 year old (19.3%) men were using PrEP intermittently than other age groups (χ^2 11.9, $p = 0.02$).

More men who reported visiting a doctor in the past 12 months also reported PrEP use in the last 12 months (46.3%) compared to those not reporting a doctor's visit (10.0%) (χ^2 14.9, $p < 0.001$). Men reporting an STI in the past 12 months had a higher proportion using PrEP (74.3%) compared to those not reporting an STI (31.5%) (χ^2 60.5, $p < 0.001$). In terms of partners, men reporting having any HIV-positive partners (74.7%) versus no HIV-positive partners (36.9%) (χ^2 33.8, $p < 0.001$), and having any unknown HIV status partners (55.6%) versus no unknown HIV status partners (41.4%) (χ^2 4.3, $p = 0.04$) were more likely to be using PrEP in the past 12 months. Moreover, men reporting condomless insertive anal sex in the past 6 months (58.9%) versus no condomless insertive anal sex in the past 6 months (21.5%) (χ^2 55.0, $p < 0.001$) and any condomless receptive anal sex in the past 6 months (61.7%) versus no condomless receptive anal sex in the past 6 months (24.4%) (χ^2 55.6, $p < 0.001$) were more likely to be using PrEP. Finally, having any unknown status partner versus not was not significantly different in terms of the proportion using PrEP every day or less than every day in the past 30 days (Table 2).

Table 1 Demographic characteristics and PrEP use among HIV-uninfected men who have sex with men, San Francisco, 2017 (n = 399)

	No PrEP Past 12 months		PrEP Use Past 12 months		χ^2, p	PrEP Use Past 6 Months			PrEP Use every day past 30 days			PrEP use less than every day past 30 days		
	N	% (row)	N	%		N	%	χ^2, p	N	%	χ^2, p	N	%	χ^2, p
Total	225	56.4	174	43.6	–	159**	39.9	–	102**	25.6	–	59**	14.8	–
Age					45.9, < 0.001			42.4, < 0.001			33.8, < 0.001			11.9, 0.02
18–24	19	54.3	16	45.7		14	40.0		6	17.1		8	22.9	
25–34	73	48.7	77	51.3		68	45.3		41	27.3		29	19.3	
35–44	32	38.6	51	61.5		50	60.2		38	45.8		12	14.5	
45–54	41	64.1	23	36.0		20	31.3		13	20.3		8	12.5	
55 +	60	89.6	7	10.5		7	10.5		4	6.0		2	3.0	
Race/ethnicity					2.0, 0.7			1.3, 0.9			4.0, 0.4			3.9, 0.4
Asian	18	47.4	20	52.6		18	47.4		14	36.8		4	10.5	
Black/African American	10	55.6	8	44.4		8	44.4		5	27.8		3	16.7	
White	121	59.0	84	41.0		79	38.5		53	25.9		26	12.7	
Latino	57	55.3	46	44.7		41	39.8		21	20.4		21	20.4	
Other	19	54.3	16	45.7		13	37.1		9	25.7		5	14.3	
Sexual orientation					0.6			0.1			0.1*			1.0*
Straight	8	100	–	–		–	–		–	–		–	–	
Gay	195	55.1	159	44.9		147	41.5		96	27.1		53	15.0	
Bisexual	21	60.0	14	40.0		10	28.6		5	14.3		5	14.3	
Education					0.1			0.1			0.1			0.4
Less than HS	2	100	–	–		–	–		–	–		–	–	
HS	22	55.0	18	45.0		16	40.0		8	20.0		9	22.5	
Some college	49	59.0	34	41.0		28	33.7		15	18.1		13	15.7	
Bachelors	83	49.7	84	50.3		77	46.1		52	31.1		25	15.0	
Post grad	69	64.5	38	35.5		37	34.6		26	24.3		12	11.2	
Living wage					1.9, 0.2			3.0. 0.1			2.8, 0.1			0.006, 1.0
Yes	151	54.1	128	45.9		119	42.7		78	28.0		41	14.7	
No	74	61.7	46	38.3		40	33.3		24	20.0		18	15.0	

*Fisher's exact

**Due to missing data n's for everyday use and less than everyday use in the past 30 days do not sum to the total of use in the past 6 months

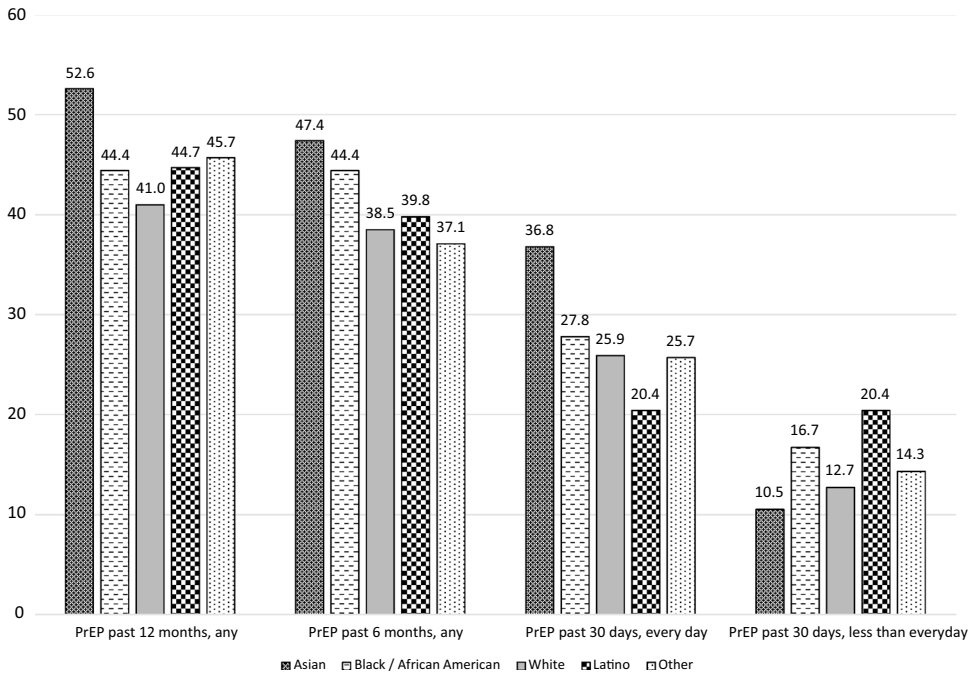

Fig. 1 Percent PrEP use among HIV uninfected MSM by race/ethnicity, San Francisco, 2017

Discussion

The level of PrEP use in the past 12 months among HIV-negative MSM in San Francisco is approaching 50%. Additionally, sustained community PrEP use approaches levels thought to be needed to maximize PrEP's role in reducing new HIV infections in the community. Encouragingly, the previously noted disparities in use by race/ethnicity were not evident in 2017 at any of the time points measured [15].

However, a substantial proportion of MSM, more than one in seven, reported using PrEP less than every day in the last 30 days (i.e., intermittently, on-demand or a missed dose). While research has suggested that on demand dosing of PrEP is effective, [12] and that 4–7 doses per week reduces risk of HIV infection to zero [13] the recommendation is still that persons using PrEP should be taking PrEP every day [16].

This analysis of PrEP use by different time periods provides insights on which groups initiate PrEP, continue with PrEP, or use intermittently. For example, while any PrEP use in the past 12 months and past 6 months was high, (3) consistent PrEP use in the past 30 days was nearly half the level of 12 month use. Moreover, the pattern of PrEP use less than everyday in the past 30 days shifts towards younger men. Finally, the drop in use from past 6 months use to past 30 day use, every day, and the higher levels of intermittent use in the past 30 days among Black/African American and Latino men is notable and bears further investigation.

Our analysis has limitations. A primary limitation is the cross-sectional nature of the data. Although we asked use at different time points, these community indicators do not capture individual levels of persistence or adherence. That is the nature of the measures (i.e. not mutually exclusive) do not allow us to determine which respondents were using PrEP consistently over the recall periods. Nonetheless, PrEP effectiveness in reducing new HIV infections on the population level is thought to depend upon a fairly high level of uptake across all susceptible community members [1].

Cross-sectional data are also limited in determining causality, which is especially important in determining the relationship between PrEP use and changes in sexual risk behavior. For example, men reporting visiting their doctor or having STIs reported higher levels of PrEP-use regardless of the period of use, and may be due to increase in doctors' visits and STI screening as part of their PrEP care or the appropriate prescription of PrEP for men who have indications for its use. Additionally, higher proportions of men reporting any HIV positive partners and any unknown HIV status partners were using PrEP. Moreover, higher proportions of men reporting any condomless insertive anal sex, and any condomless receptive anal sex had higher levels of PrEP use. However, we cannot determine if having any HIV positive or unknown status partners or condomless anal sex resulted from the use of PrEP or was an existing pattern of behavior which motivated the uptake of PrEP. Longitudinal analyses of cohort studies that report on sexual risk behavior before, during and after PrEP use will more precisely address these questions and contribute to knowledge of HIV and STI risk among MSM as PrEP uptake continues to rise.

Our analysis is subject to additional limitations. The imprecise measures of PrEP use in this study limit our interpretation to the community levels of PrEP use at various

Table 2 Healthcare and risk characteristics and PrEP use among HIV-uninfected men who have sex with men, San Francisco, 2017 (n = 399)

	No PrEP Past 12 months		PrEP Use Past 12 months		χ^2, p	PrEP Use Past 6 Months			PrEP Use every day past 30 days			PrEP use less than every day past 30 days		
	N	% (row)	N	%		N	%	χ^2, p	N	%	χ^2, p	N	%	χ^2, p
Current health insurance					0.9, 0.3			3.2, 0.07			0.9, 0.3			0.2, 0.6
Yes	192	55.0	157	45.0		148	41.3		94	26.3		54	15.1	
No	33	66.0	17	34.0		11	26.8		8	19.5		5	12.2	
Has usual source of care					2.1, 0.1			3.3, 0.1			0.002*			1.2, 0.3
Yes	193	55.3	156	44.7		145	41.3		98	28.1		49	14.0	
No	33	66.0	17	34.0		14	28.0		4	8.0		10	20.0	
Visited MD in past 12 months					14.9, < 0.001			18.0, < 0.001			< 0.001*			0.1*
Yes	198	53.7	171	46.3		158	42.8		102	27.3		58	15.7	
No	27	90.0	3	10.0		1	3.3		0	0		1	3.3	
Methamphetamine Use past 12 months					0.0004. 1.0			0.05, 0.8			0.4, 0.5			0.9, 0.3
Yes	26	56.5	20	46.5		19	41.3		10	21.7		9	19.6	
No	199	56.4	154	43.6		140	39.7		92	26.1		50	14.2	
Binge drink past 30 days					0.4, 0.5			0.003, 1.0			0.001, 1.0			0.1, 0.7
Yes	87	54.4	73	45.6		64	40.0		41	25.6		25	15.6	
No	138	57.7	101	42.3		95	39.8		61	25.5		34	14.2	
Any STI past 12 months					60.5, < 0.001			56.0, < 0.001			31.7, < 0.001			12.5, < 0.001
Yes	29	25.7	84	74.3		78	69.0		51	45.1		28	24.8	
No	196	68.5	90	31.5		81	28.3		51	17.8		31	10.8	
Any HIV positive partner past 6 months					33.8, < 0.001			36.9, < 0.001			14.9, < 0.001			15.0, < 0.001
Yes	18	25.4	53	74.7		51	71.8		31	43.7		21	29.6	
No	207	63.1	121	36.9		108	32.9		71	21.7		38	11.6	
Any unknown HIV status partner past 6 months					4.3, 0.04			4.9, 0.03			4.7, 0.03			0.4, 0.5
Yes	28	44.4	35	55.6		33	52.4		23	36.5		11	17.5	
No	197	58.6	139	41.4		126	37.5		79	23.5		48	14.3	
Any condomless insertive anal sex past 6 months					55.0, < 0.001			55.9, < 0.001			38.8, < 0.001			7.0, 0.01
Yes	97	41.1	139	58.9		130	55.3		87	37.0		44	18.7	
No	128	78.5	35	21.5		29	17.8		15	8.5		15	9.2	
Any condomless receptive anal sex past 6 months					56.4, < 0.001			51.0, < 0.001			28.7, < 0.001			7.2, 0.01
Yes	79	38.6	127	61.7		117	56.8		76	36.9		40	19.4	
No	146	75.7	47	24.4		42	21.8		26	13.5		19	9.8	

*Fisher's exact

time points and in no way should be construed as individual persistence of adherence. Moreover, recall bias may have affected measures of behavior and STI diagnosis within the prior 12 months. Lastly, NHBS sampling methods may not reach men on the down-low or who do not attend typical gay-related venues. However, NHBS is viewed as the gold standard to sample MSM in the US for HIV behavioral surveillance conducted by the CDC and has been shown to capture 79% of the adult MSM population in San Francisco [17].

Despite these limitations we have documented reasonably high and sustained community levels of PrEP use in San Francisco which is thought to be required for maximum effect on reducing new HIV infections in this city. Two additional findings merit further investigation. Evidence is needed to confirm whether high 12 month and 6 month use compared to 30 day use is related to self-assessment of lower sexual risk-profile and not due to barriers to adherence/persistence. Additionally, motivations for intermittent PrEP use among MSM in San Francisco and in particular among younger, Black/African American and Latino MSM should be better understood to again gauge the potential risk of HIV acquisition in these populations. While our data overall suggest the PrEP use disparity by race/ethnicity has narrowed in San Francisco, the root causes for community barriers to PrEP uptake and adherence may remain with the current clinical regimen for PrEP use [18–21]. Perhaps new modes of PrEP delivery such as long-acting injectable PrEP may simplify uptake, persistence and adherence reducing disparities in use leading to comparable reductions in new HIV infections among sub groups of MSM [22–25].

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Compliance with Ethical Standards

Conflict of interest All authors declare that they have no conflict of interest.

Ethical Approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional 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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