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## Monitoring HIV pre-exposure prophylaxis use among men who have sex with men in Washington State: findings from an internet-based survey

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### Abstract

**Background:** Many state and local health departments now promote and support the use of HIV pre-exposure prophylaxis (PrEP), yet monitoring use of the intervention at the population level remains challenging.

**Methods:** We report the results of an online survey designed to measure PrEP use among men who have sex with men (MSM) in Washington State. Data on the proportion of men with indications for PrEP based on state guidelines and levels of awareness, interest, and use of PrEP are presented for 1,080 cisgender male respondents who completed the survey between January 1 and February 28, 2017. We conducted bivariate and multivariable logistic regression to identify factors associated with current PrEP use. To examine patterns of discontinuation, we conducted Cox Proportional Hazards regression and fit a Kaplan Meier curve to reported data on time on PrEP.

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**Results:** Eighty percent of respondents had heard of PrEP, 19% reported current use, and 36% of men who had never used PrEP wanted to start taking it. Among MSM for whom state guidelines recommend PrEP, 31% were taking it. In multivariable analysis, current PrEP use was associated with older age, higher education, and meeting indications for PrEP use. Our data suggest that 20% of PrEP users discontinue within 12 months, and men with lower educational attainment were more likely to discontinue.

**Conclusions:** Despite high levels of use, there is significant unmet need for PrEP in Washington. Our experience indicates that internet surveys are feasible and informative for monitoring PrEP use in MSM.

## Summary

Data from an internet-based survey indicate that use of HIV pre-exposure prophylaxis is high among Washington State men who have sex with men, though there remains substantial unmet need.

## Keywords

Pre-exposure prophylaxis; PrEP; HIV prevention; Men who have sex with men; Internet survey

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## Introduction

Expanding access to HIV pre-exposure prophylaxis (PrEP) has become a pillar of the HIV prevention strategy in the United States,<sup>1</sup> supported by strong evidence of the intervention's efficacy and effectiveness from clinical trials and observational studies.<sup>2</sup> The potential population-level impact of PrEP is particularly significant for men who have sex with men (MSM), who experienced 70% of new HIV diagnoses nationally in 2016.<sup>3</sup> The U.S. Public Health Service has issued guidelines recommending PrEP for high-risk MSM and other priority populations,<sup>4</sup> but large gaps have been reported between eligibility, interest, and use.<sup>5-7</sup> To inform efforts to improve PrEP delivery, reliable data are needed to describe the populations at risk, monitor use, and characterize the barriers to uptake and retention in care.

Measuring PrEP use among MSM is methodologically challenging due to the lack of efficient and unbiased sampling methods for this population. In the U.S., data on MSM's use of prevention interventions have primarily come from clinic samples,<sup>7,8</sup> which are limited to persons who seek care in selected clinics or healthcare organizations, and venue- and event-based samples,<sup>9,10</sup> which are often expensive and limited in geographic scope. Internet-based recruitment has gained popularity as an alternative strategy for sampling MSM,<sup>11-15</sup> but this approach has not yet been widely adopted by state and local health departments for purposes of public health monitoring.

In this paper, we present the findings from the 2017 Washington HIV Prevention Project (WHPP), an internet-based survey developed to monitor the success of Washington State's efforts to promote PrEP use among high-risk resident MSM. To evaluate the consistency of WHPP findings with data from offline samples, we compare our estimates of PrEP use to estimates from an in-person survey administered at the 2017 Seattle Pride parade.<sup>16</sup>

## Methods

We recruited participants to complete an online cross-sectional survey between January 1 and February 28, 2017. Participants accessed the survey through banner and text-based pop-up advertisements on social media, male-male geosocial networking, and general LGBTQ-interest apps and websites. Upon clicking past a landing webpage with information on the purpose of the survey, participants were randomly shown one of three informed consent pages that differed only in the stated incentive: a \$10 Amazon gift certificate, a \$10 donation to charity, or no monetary incentive. Through daily monitoring of IP addresses and timestamps (described in Supplemental Digital Content 1), we identified a pattern of seemingly fraudulent responses that led us to discontinue the gift certificate incentive after nine days.

Consenting participants were shown a set of questions to screen for eligibility. Persons were ineligible if they were female sex at birth, age <16 years, lived outside of Washington, did not have oral or anal sex with a man in the past 12 months, reported ever testing positive for HIV, or had an Internet Protocol (IP) address outside the U.S. Additional details on survey methods are provided in Supplemental Digital Content 1. Because this work was conducted as a public health surveillance activity, it was determined not to be human subjects research by the University of Washington Institutional Review Board.

## Key Measures

Prior to answering questions about PrEP, respondents were presented with the following description: “PrEP is a pill taken every day by HIV-negative people to reduce the risk of getting HIV. It is currently available under the brand name Truvada®.” Respondents who had heard of PrEP were asked if they were currently taking or had taken it in the past. Men who had never taken PrEP were asked if they were interested in taking it, with response options of “Yes, I want to start taking PrEP”, “I am not sure about PrEP, but I would like to learn more about it,” and “No, I am not interested in taking PrEP.” Follow-up questions asked why they were not interested or had not yet initiated (see Supplemental Digital Content 2 for response options). Current and past PrEP users reported the month and year they most recently started PrEP, and men who had discontinued additionally reported the month and year in which they last took PrEP. We measured self-reported adherence over the past 30 days and defined high adherence as taking 4 pills per week on average.<sup>17</sup> Men who had discontinued PrEP indicated why they stopped their medication and whether they were interested in taking it again. All participants were asked how effective they thought PrEP is at preventing HIV infection if taken every day.

PrEP candidacy was defined according to guidelines developed by Public Health – Seattle and King County and the Washington State Department of Health (WADOH).<sup>18</sup> These guidelines were adapted from those issued by the U.S. Public Health Service,<sup>4</sup> the International Antiviral Society—USA,<sup>19</sup> and the World Health Organization<sup>20</sup> to reflect the local epidemic context, and were informed by analyses that identified factors associated with HIV acquisition. The guidelines define two tiers of risk: persons for whom medical providers should recommend PrEP, and persons with whom providers should discuss PrEP (Table 1).

To assess heterogeneity in PrEP uptake across the state, we categorized respondents as residing in one of three regions based on reported ZIP codes: King County (which includes Seattle), other counties in western Washington, and eastern Washington (see Figure, Supplemental Digital Content 3, for a regional map).

## Analyses

Duplicate and invalid responses were flagged and removed using a modified version of a published protocol,<sup>21</sup> described in Supplemental Digital Content 1. Data are presented from respondents who completed the survey at least through initial questions about PrEP awareness and use. To identify factors associated with current PrEP use, we conducted logistic regression. We first examined associations for a base model including the following covariates, which were defined *a priori*: region, age, race/ethnicity, sexual orientation, education, income, and PrEP candidacy. In an exploratory analysis, we examined bivariate associations with other factors measured in our survey, including health insurance, perceived effectiveness of PrEP, and specific HIV risk indicators. Our multivariable exploratory model included base model social and demographic variables and additional factors that were significant in bivariate analyses.

We estimated time to PrEP discontinuation by fitting a Kaplan Meier curve to reported data on dates of first and last PrEP use. Current users' time on PrEP was censored at the date of survey completion. Time-invariant predictors of discontinuation (age at PrEP initiation, race/ethnicity, education, and region of residence) were explored using multivariable Cox Proportional Hazards regression, employing the exact marginal method to adjust for ties.

To assess the consistency of WHPP findings with data from sources using offline (in-person) recruitment, we compared estimates of PrEP awareness and use with those from a sample of MSM who completed a self- or interviewer-administered paper questionnaire at the Seattle Pride Parade in June 2017.<sup>16</sup> In this analysis, both samples were restricted to cisgender males living in the Seattle metropolitan area. To account for differences in the HIV risk profile of the two samples, we tabulated the proportion reporting PrEP use among high-risk men for whom state guidelines recommend the intervention. Because the Pride survey did not measure current partnerships with HIV-positive partners, this indication was not included when defining risk groups for this comparison. Analyses were conducted using Stata version 13.1 (StataCorp, College Station, TX). An alpha of 0.05 was used for significance testing.

## Results

### Recruitment, response rates, and cost

In the two-month recruitment period, 2,767 unique individuals consented to the survey, 44% of whom (1,225) met inclusion criteria. Seventy-nine percent (973) of eligible participants completed the survey. The costs of recruitment, survey administration, and incentives totaled \$23.69 per complete response (see Appendix, Supplementary Digital Content 1, for details on response rates and expenses). For this analysis, we excluded respondents who reported a gender other than male (n=32), resulting in 1,080 responses from cisgender males who

completed the survey through initial questions about PrEP, of whom 924 completed the entire survey.

### Sample characteristics

The median age in the sample was 30 (range: 16–82), and 61% of respondents were below the age of 35 (Table 2). Two-thirds of the sample (68%) identified as non-Hispanic white, and 49% reported a 4-year college degree or higher education. Fifty-six percent of respondents reported residence in King County. Based on reported behaviors and experiences within the past 12 months, 33% of men met criteria indicating that medical providers should recommend PrEP initiation. Another 30% of men met criteria indicating that a medical provider should discuss PrEP with them.

### Awareness, interest, and use of PrEP

Eight in ten respondents (79%) had heard of PrEP, 19% reported current use, and 4% had used PrEP in the past (Table 2). By Washington State PrEP candidacy category, 31% of men for whom PrEP is recommended and 25% of those with whom it should be discussed reported current use, compared to only 4% of those for whom PrEP is not indicated. Among men in the “recommend” category, current PrEP use was reported by 37% in King County, 20% in other western Washington counties, and 22% in eastern Washington.

More than one third (36%) of men who had never used PrEP indicated that they wanted to start taking it, and 33% weren't sure but wanted to learn more. Among never-users for whom PrEP is recommended, 56% wanted to start PrEP and 23% weren't sure; among those with whom PrEP should be discussed, 51% wanted to start and 32% weren't sure. Reported reasons for not using or not being interested in PrEP are presented in Figure 1, stratified by PrEP candidacy category and interest. Overall, the most common barriers to uptake among PrEP-naïve men for whom PrEP is recommended were a perception of being at low risk for HIV (29%), concern about side-effects (26%), and cost or insurance coverage issues (23%).

### Correlates of current PrEP use

In bivariate analyses, current PrEP use was associated with residence in King County, older age (relative to 18–24), identifying as gay or homosexual, higher education, higher income, and meeting criteria for PrEP being recommended or discussed (Table 3). In the base multivariable model adjusting for *a priori* covariates, only age, education, and PrEP candidacy remained significantly associated with current use. In a multivariable exploratory model, older age, having health insurance, diagnosis with rectal gonorrhea or syphilis, reporting 10 anal sex partners in the past 12 months, having a current HIV-positive male partner, CAS with a partner who was not main/primary or whose HIV status was positive or unknown, poppers use, and perceiving PrEP to be 90% effective were positively associated with current PrEP use.

### PrEP adherence and discontinuation

Current PrEP users reported high adherence, with 93% having taken an average of 4 or more pills per week in the past 30 days and 66% reporting perfect adherence. Current users reported having started PrEP a median of 12 months prior to survey completion

(interquartile range (IQR): 5–20), and past users reported a median of 5 months of use (IQR: 2–8.5). The most common reasons for stopping PrEP were a perception of no longer being at high risk for HIV (52%), concern about long-term health effects (27%), not being able to afford PrEP or having lost insurance (23%), and side-effects (20%). In a Kaplan-Meier analysis (Figure 2), we estimated that 20% of men discontinued PrEP within 12 months of initiation (95% CI: 15%–26%). Discontinuation was associated with having a high school education or lower (adjusted hazard ratio (aHR): 4.86, 95% CI: 1.77–13.38) or having completed some college or vocational school (aHR: 2.08, 95% CI: 1.02–4.25), relative to having a 4-year college degree or higher, but was not significantly associated with age, race/ethnicity, or region. Fifty-three percent of men who had discontinued PrEP wanted to start taking it again, and 28% were unsure about taking PrEP again.

### Comparison with the 2017 Seattle Pride Parade survey

Awareness of PrEP was similar among the 739 Seattle-area WHPP respondents (82%) and the sample of 297 HIV-negative cisgender MSM who completed the 2017 Seattle Pride Parade survey (86%; chi-square  $p=0.073$ ). In both samples, 26% of men reported lifetime use of PrEP, with 21% of WHPP and 22% of Pride survey respondents reporting current use ( $p=0.853$ ). A higher proportion of men in the WHPP sample reported behaviors indicating that PrEP should be recommended (33% vs. 19%;  $p<0.001$ ). Among those in this high-risk category, 39% of WHPP respondents and 36% of Pride survey respondents reported lifetime use of PrEP ( $p=0.739$ ), and 33% and 27% reported current use, respectively ( $p=0.398$ ).

### Discussion

In this sample of internet-recruited Washington State MSM, awareness and interest in PrEP were high, with more than half of high-risk men who had never used PrEP indicating that they wanted to start taking it. Current PrEP use was associated with sexual and drug-related HIV risk indicators in multivariable regression, and nearly one-third of men classified by state guidelines as having the strongest indication for PrEP reported current use. However, the gaps between reported interest and use of PrEP reveal substantial unmet need, and our analyses indicate sociodemographic disparities in uptake.

Previous surveys of MSM in the United States, conducted between 2014 and 2016, have reported 4%–10% current or past-12-month use of PrEP<sup>5,6,22</sup> and 10%–15% lifetime use.<sup>23,24</sup> Among higher risk men, these studies have found that 6%–13% report current or past-12-month use.<sup>5,6</sup> The differences between these estimates and our findings are likely partially attributable to increased PrEP uptake in the years over which these data were collected. However, the 23%–26% lifetime and 19%–22% current use of PrEP reported by men in the WHPP and Seattle Pride survey samples suggest that PrEP use is higher in Washington State than in many other parts of the country.

Despite the high uptake of PrEP reported by men at high risk for HIV, many respondents reported barriers to PrEP initiation. Thirty percent of PrEP-naïve men who met indications for PrEP being recommended or discussed perceived themselves to be at low risk. Although Washington State guidelines may misclassify some individuals, our findings suggest a potential disconnect between perceived and actual risk. Among men recommended to



initiate PrEP who wanted to start taking it, reported barriers suggest that many men face real or perceived financial barriers to PrEP, lack sufficient information about the intervention or how to receive it, or live somewhere where access is inadequate.

In particular, PrEP use was lower among younger, less educated, and uninsured men. Of note, we did not observe disparities in PrEP use by race/ethnicity, though our sample of black respondents was small. Some previous surveys of MSM have similarly reported no significant differences in PrEP use by race/ethnicity,<sup>5,23</sup> but others have reported lower use among black and other minority MSM.<sup>6,24,25</sup> In light of the high incidence of HIV among black and Hispanic MSM,<sup>26</sup> concerted efforts are needed to ensure that PrEP reaches these at-risk populations.

We estimated that in our population, 20% of men who initiate PrEP will discontinue by 12 months. This estimate is similar to that derived from a cohort study of patients in northern California,<sup>27</sup> but substantially lower than estimates from studies focusing on STD clinic patients and other high-risk populations.<sup>28,29</sup> As in prior studies,<sup>23,28</sup> the primary reasons for discontinuation reported by WHPP participants included no longer being at high risk, concern about long-term health effects, and financial barriers. While discontinuation may be indicated for some men, these findings point to a need for more consistent follow-up to encourage patients to discuss their concerns before discontinuing their medication. More than half of men who had discontinued PrEP expressed interest in starting it again, highlighting the need for clinicians and public health staff to serially discuss the intervention with men whose risks may be dynamic.

Our approach to PrEP monitoring has implications for diverse public health HIV programs. To inform implementation and evaluate the success of efforts to promote PrEP and other interventions, state and local health departments need to establish systems to monitor patterns of utilization and related behaviors at the population level. Alongside data from general population probability samples, event-based surveys, partner services interviews, and in-person surveys of high-risk groups (i.e., the National HIV Behavioral Surveillance System), internet-based surveys can be a valuable component of a comprehensive HIV surveillance strategy. Internet-based surveys have several advantages over other methods, particularly for recruitment of MSM: they can efficiently collect data over broad geographic areas; avoid linking PrEP monitoring to STI surveillance activities, which likely results in biased estimates since persons on PrEP are screened for asymptomatic STIs as part of their care; and are relatively inexpensive, at approximately \$24 per completed response. Collaboration between public health and academic partners could facilitate expansion of internet-based public health monitoring to jurisdictions with limited time or expertise, a factor that was key to the success of this project.

Our findings have several limitations. First, our sample may not be representative of all Washington State MSM. As with other internet-based samples,<sup>13,14,30</sup> WHPP participants were young, highly educated, and reported high engagement in HIV risk behaviors. The fact that the prevalence of PrEP use was similar in the WHPP and Pride samples lends credibility to the estimates, though the representativeness of the Pride survey sample is also uncertain. Second, the relative anonymity afforded to participants in online surveys makes it difficult to

verify their eligibility and prevent duplicate responses. Through monitoring of IP addresses, time stamps, and response patterns, we detected 851 apparently invalid entries, but this approach is not foolproof. Third, our analyses of time to PrEP discontinuation assumed uninformative censoring (i.e. that current and past PrEP users were comparably likely to complete the survey), and used data on dates of PrEP use during a period of increasing awareness and uptake. These data may not be generalizable to men starting PrEP now or in the future. Additionally, our estimates of time to discontinuation might overestimate the duration of PrEP use, since our cross-sectional design may be more likely to collect data on longer periods of PrEP use among respondents who have gone on and off PrEP multiple times (length time bias).

The 2017 WHPP survey suggests high use of PrEP among MSM in Washington State, particularly among those at highest risk for HIV. Despite this success, there is substantial unmet need for PrEP; many men – particularly young, less educated MSM – require additional information or assistance to access PrEP, and our region has not yet achieved our defined 2020 objective of 50% PrEP use among MSM at highest risk.<sup>16</sup> Our experience indicates that internet-based monitoring to measure PrEP utilization is feasible, relatively low cost, and allows for collection of statewide data which may not otherwise be available. Particularly if they are repeated at regular intervals, the data such surveys generate can play a critical role in monitoring the uptake of public health interventions over time and in identifying populations with disproportionate unmet need.

## Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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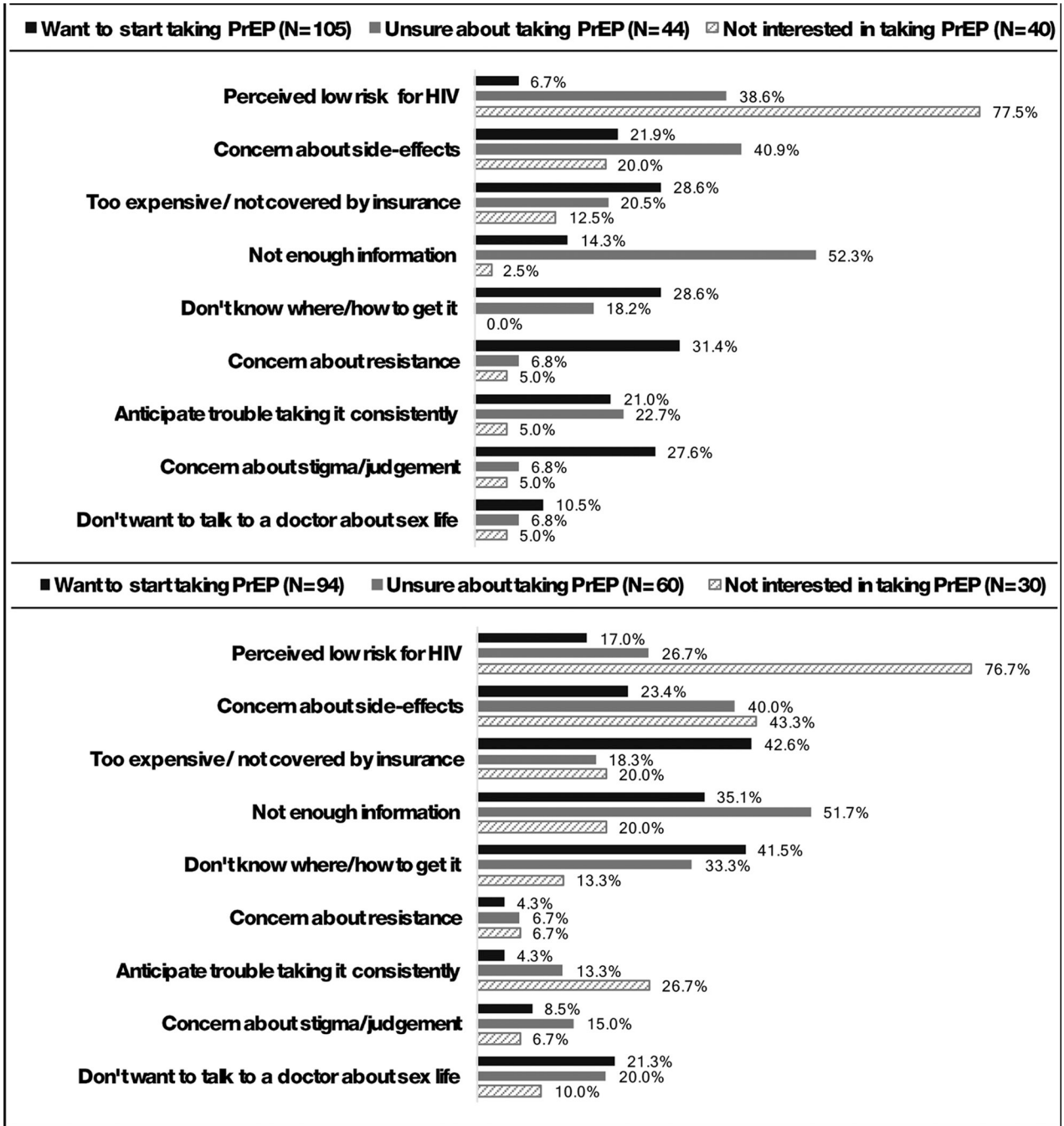


Figure 1: Reasons for not taking or not being interested in PrEP among PrEP-naïve MSM who meet local indications for PrEP being recommended<sup>a</sup> (top panel) or discussed<sup>b</sup> (bottom panel), by reported interest in starting PrEP (N=373).

<sup>a</sup>MSM who reported a diagnosis of rectal gonorrhea or syphilis, use of methamphetamine or poppers, or history of exchange sex in the prior 12 months, and those in ongoing sexual relationships with HIV-positive male partners who are not on ART, on ART <6 months, or not virologically suppressed; <sup>b</sup>MSM who do not meet criteria for recommending PrEP and who reported CAS with a partner who is not main/primary, CAS with an HIV-positive or unknown status partner, diagnosis of urethral gonorrhea or rectal chlamydia, or injection

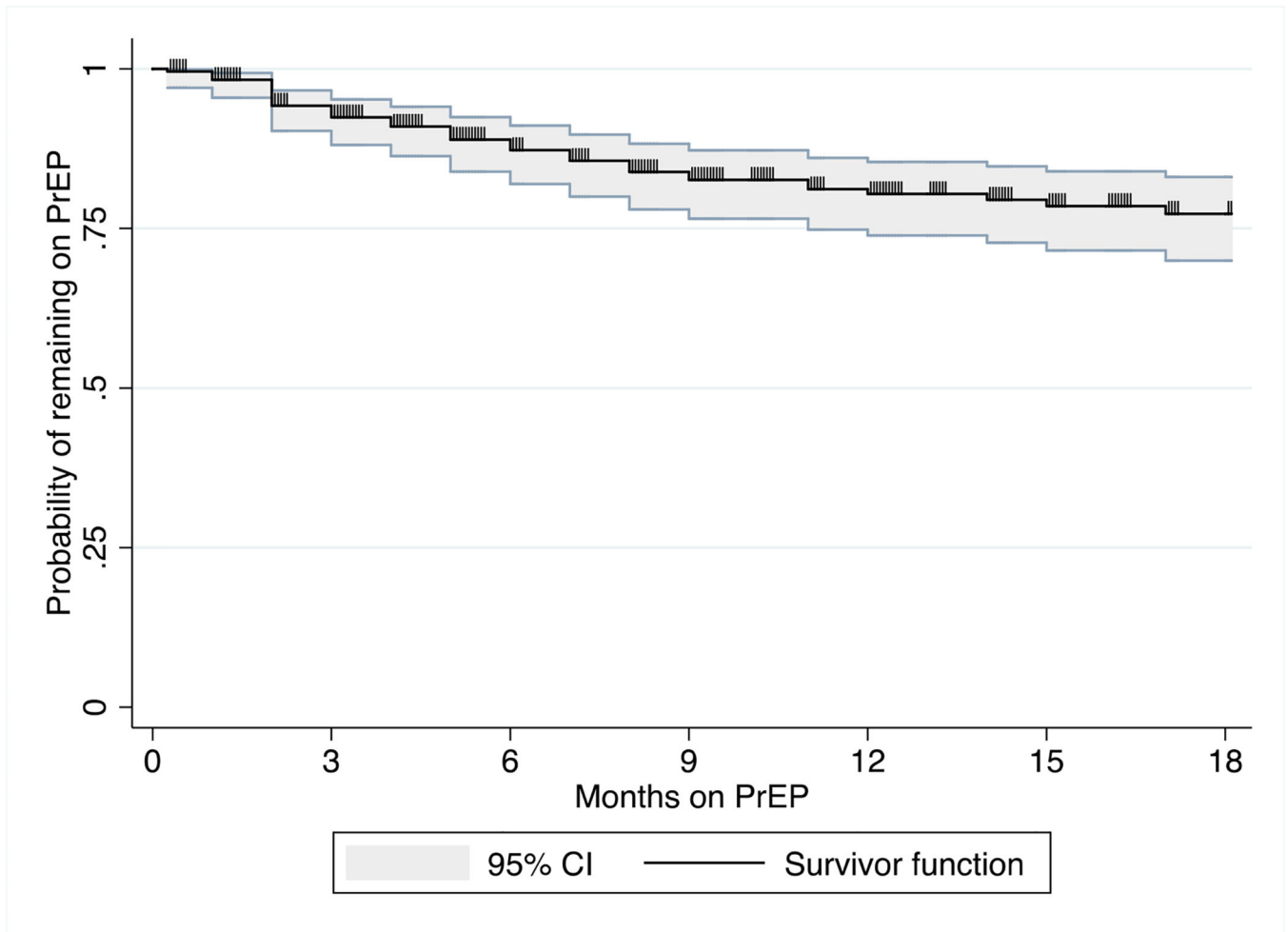
drug use in the past 12 months, and those in ongoing sexual relationships with HIV-positive male partners who have been on ART ≥ 6 months and who are virologically suppressed.

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**Figure 2: Time to PrEP discontinuation<sup>a</sup>**

<sup>a</sup>Includes data from 194 current and 44 past PrEP users who provided data on their dates of PrEP use. Tic marks indicate censoring times for current PrEP users. The graph is truncated at 18 months; 60 men reported having taken PrEP for 18 months or longer.

**Table 1:**

PrEP candidacy categories based on Washington State PrEP implementation guidelines

<p>Recommend PrEP for MSM with any of the following risk factors:</p> <ul style="list-style-type: none"> <li>• Diagnosis of rectal gonorrhea or syphilis<sup>a</sup> in the past 12 months</li> <li>• Methamphetamine or poppers use in the past 12 months</li> <li>• History of exchanging sex for money or drugs in the past 12 months</li> <li>• Ongoing sexual partnership(s) with HIV-positive partners(s) who are not on antiretroviral therapy (ART), started ART &lt;6 months ago, or are not virologically suppressed</li> </ul> <p>Discuss PrEP with MSM who do not meet the above criteria for recommending PrEP and who report any of the following<sup>a</sup>:</p> <ul style="list-style-type: none"> <li>• Diagnosis of urethral gonorrhea or rectal chlamydia in the past 12 months</li> <li>• Condomless anal sex (CAS) with a partner not considered to be main/primary, or with a partner of unknown or positive HIV status in the past 12 months<sup>b</sup></li> <li>• Non-prescription injection drug use in the past 12 months</li> <li>• Ongoing sexual partnership(s) with HIV-positive partners(s) who have been on ART ≥ 6 months and are virologically suppressed</li> </ul>
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<sup>a</sup>The guidelines refer to diagnosis of *early* syphilis. Due to the difficulty of measuring stage of infection via self-report, for this analysis we included any diagnosis of syphilis as an indication for recommending PrEP;

<sup>b</sup>Three indications for discussing PrEP with MSM were not measured in the survey: having an HIV-positive female partner with intentions to conceive, completing a course of post-exposure prophylaxis for non-occupational exposure, and seeking a prescription for PrEP;

<sup>c</sup>Proxy measure for CAS outside of a long-term, mutually monogamous relationship with a partner who is HIV-negative.



**Table 2:**

## Sample characteristics

	n/N <sup>a</sup>	%
<b>Recruitment platform</b>		
Social media	806/1,080	74.6%
Geosocial networking	211/1,080	19.5%
General LGBTQ interest	63/1,080	5.8%
<b><i>Demographic and social characteristics</i></b>		
<b>Region</b>		
King County	610/1,080	56.5%
Other counties in western Washington	308/1,080	28.5%
Eastern Washington	162/1,080	15.0%
<b>Age</b>		
16 to 24	313/1,080	29.0%
25 to 34	351/1,080	32.5%
35 to 44	167/1,080	15.5%
45 to 54	128/1,080	11.9%
55 and older	121/1,080	11.2%
<b>Race/ethnicity</b>		
Hispanic	198/1,067	18.6%
Non-Hispanic white	725/1,067	67.9%
Non-Hispanic black	42/1,067	3.9%
Non-Hispanic other	102/1,067	9.6%
<b>Gay/homosexual identity</b>		
	889/1,076	82.6%
<b>Education</b>		
High school or less	176/1,065	16.5%
Some college/vocational school	364/1,065	34.2%
4-year college or higher	525/1,065	49.3%
<b>Income</b>		
Less than \$15,000	110/930	11.8%
\$15,000 to \$29,999	111/930	11.9%
\$30,000 to \$49,999	167/930	18.0%
\$50,000 to \$99,999	278/930	29.9%
\$100,000 or more	215/930	23.1%
Prefer not to answer	49/930	5.3%
<b>Has health insurance</b>		
	929/1,037	89.6%
<b><i>HIV and STI testing</i></b>		
<b>HIV testing history</b>		
Never tested	219/1,074	20.4%
Tested in the past 12 months	657/1,074	61.2%
Tested >12 months ago	198/1,074	18.4%
<b>STI diagnosis (past 12 months)</b>		

	n/N <sup>a</sup>	%
Rectal gonorrhea	47/1,025	4.6%
Syphilis	57/1,025	5.6%
Any bacterial STI <sup>b</sup>	189/1,025	18.4%
<b>Sexual behaviors and drug use (past 12 months)</b>		
Anal sex role		
No anal sex	103/1,000	10.3%
Exclusively bottom	197/1,000	19.7%
Versatile	578/1,000	57.8%
Exclusively top	122/1,000	12.2%
10 anal sex partners	162/1,013	16.0%
Current main/primary male partner	443/998	44.4%
Current HIV-positive male partner	79/979	8.1%
CAS with a non-main partner	476/980	48.6%
CAS with an unknown status partner	280/975	28.7%
CAS with an HIV-positive partner	145/979	14.8%
Injection drug use	57/938	6.1%
Methamphetamine use	81/926	8.7%
Poppers use	211/926	22.8%
History of exchange sex	36/935	3.9%
<b>PrEP awareness and use</b>		
PrEP awareness	852/1,080	78.9%
Perceived effectiveness of PrEP		
Less than 75%	260/1,036	25.1%
75% to 89%	174/1,036	16.8%
90% or higher	524/1,036	50.6%
Unsure/Prefer not to answer	78/1,036	7.5%
Use of PrEP		
Never	832/1,080	77.0%
Current	200/1,080	18.5%
Past	48/1,080	4.4%
WA State PrEP guideline category		
Recommend <sup>c</sup>	303/912	33.2%
Discuss <sup>d</sup>	271/912	29.7%
Not indicated	338/912	37.1%

Acronyms: STI, sexually transmitted infection; CAS, condomless anal sex; PrEP, pre-exposure prophylaxis

<sup>a</sup>Includes data from 924 complete and 156 partial responses that completed the survey at least through questions about PrEP use. Denominators may vary due to missing data;

<sup>b</sup>Diagnosis of gonorrhea (pharyngeal, urethral, or rectal), chlamydia (pharyngeal, urethral, or rectal), or syphilis;

<sup>c</sup>MSM who reported a diagnosis of rectal gonorrhea or syphilis, use of methamphetamine or poppers, or history of exchange sex in the prior 12 months, and those in ongoing sexual relationships with HIV-positive male partners who are not on ART, on ART <6 months, or not virologically suppressed;

<sup>d</sup>MSM who do not meet criteria for recommending PrEP and who reported CAS with a partner who is not main/primary, CAS with an HIV-positive or unknown status partner, diagnosis of urethral gonorrhea or rectal chlamydia, or injection drug use in the past 12 months, and those in ongoing sexual relationships with HIV-positive male partners who have been on ART ≥ 6 months and who are virologically suppressed.

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**Table 3:**

Correlates of current PrEP use (N=850)<sup>a</sup>

	Using PrEP		Unadjusted associations		Adjusted associations		
	n	%	OR (95% CI)	p-value	Base model <sup>b</sup> aOR (95% CI)	Exploratory model <sup>c</sup> aOR (95% CI)	p-value
<i>A priori covariates</i>							
Region of residence							
King County	123	25.2%	Reference	<0.001	Reference	Reference	0.260
Other western Washington	32	13.4%	0.46 (0.30, 0.70)		0.67 (0.41, 1.09)	0.80 (0.45, 1.44)	
Eastern Washington	18	14.5%	0.50 (0.29, 0.86)		0.82 (0.44, 1.53)	1.13 (0.53, 2.42)	
Age							
16 to 24	18	7.2%	Reference	<0.001	Reference	Reference	<0.001
25 to 34	70	25.4%	4.36 (2.51, 7.57)		3.97 (2.19, 7.18)	2.99 (1.43, 6.25)	
35 to 44	44	33.1%	6.34 (3.48, 11.57)		5.23 (2.66, 10.27)	3.09 (1.33, 7.23)	
45 to 54	29	28.7%	5.17 (2.71, 9.85)		4.17 (2.03, 8.57)	3.34 (1.32, 8.41)	
55 and older	12	13.2%	1.95 (0.90, 4.23)		2.06 (0.87, 4.88)	2.31 (0.83, 6.41)	
Race/ethnicity							
Non-Hispanic white	125	21.3%	Reference	0.717	Reference	Reference	0.784
Hispanic	26	17.4%	0.78 (0.49, 1.25)		0.76 (0.45, 1.29)	0.96 (0.50, 1.84)	
Non-Hispanic black	7	21.9%	1.03 (0.44, 2.45)		0.86 (0.32, 2.33)	0.60 (0.19, 1.91)	
Non-Hispanic other	15	18.3%	0.83 (0.46, 1.50)		0.95 (0.47, 1.90)	0.98 (0.44, 2.17)	
Gay/homosexual identity	160	22.3%	2.68 (1.47, 4.87)	0.001	1.90 (0.96, 3.75)	1.50 (0.67, 3.39)	0.326
Education							
High school or less	7	5.2%	Reference	<0.001	Reference	Reference	0.002
Some college/vocational school	41	15.0%	3.23 (1.41, 7.41)		2.00 (0.82, 4.89)	1.50 (0.52, 4.33)	
4-year college or higher	125	28.3%	7.21 (3.28, 15.86)		3.66 (1.55, 8.66)	2.34 (0.83, 6.55)	
Income							
Less than \$15,000	7	7.1%	Reference	<0.001	Reference	Reference	0.319
\$15,000 to \$29,999	13	12.6%	1.90 (0.72, 4.98)		2.07 (0.73, 5.86)	1.76 (0.53, 5.87)	
\$30,000 to \$49,999	34	23.1%	3.95 (1.68, 9.33)		2.80 (1.09, 7.14)	2.84 (0.98, 8.29)	
\$50,000 to \$99,999	59	22.8%	3.88 (1.71, 8.82)		2.37 (0.96, 5.86)	1.96 (0.68, 5.62)	

	Using PrEP			Unadjusted associations			Adjusted associations		
	n	%	OR (95% CI)	p-value	aOR (95% CI)	p-value	aOR (95% CI)	p-value	
\$100,000 or more	54	27.3%	4.93 (2.15, 11.30)		2.90 (1.13, 7.46)		1.84 (0.62, 5.50)		
I prefer not to answer	6	13.6%	2.08 (0.65, 6.58)		1.94 (0.54, 7.01)		1.77 (0.39, 8.12)		
WA State PrEP guidelines category				<0.001		<0.001			
Not indicated	13	4.1%	Reference		Reference				
Discuss <sup>d</sup>	69	27.2%	8.81 (4.74, 16.37)		10.14 (5.31, 19.37)				
Recommend <sup>e</sup>	91	33.0%	11.62 (6.32, 21.36)		13.91 (7.35, 26.34)				
<b>Exploratory covariates</b>									
Has health insurance	170	21.9%	6.74 (2.10, 21.67)	0.001			6.16 (1.57, 24.14)	0.009	
Diagnosis with rectal gonorrhea or syphilis	27	41.5%	3.11 (1.84, 5.26)	<0.001			3.35 (1.49, 7.49)	0.003	
Anal sex role				<0.001				0.364	
No anal sex	1	1.0%	0.03 (0.00, 0.24)				0.28 (0.03, 2.33)		
Exclusively bottom	20	12.1%	0.41 (0.21, 0.78)				0.74 (0.31, 1.74)		
Versatile	127	25.9%	1.04 (0.63, 1.70)				1.13 (0.58, 2.20)		
Exclusively top	25	25.3%	Reference				Reference		
10 anal sex partners	83	60.6%	10.64 (7.08, 16.00)	<0.001			2.99 (1.73, 5.14)	<0.001	
Current HIV-positive male partner	30	41.1%	3.09 (1.88, 5.10)	<0.001			3.63 (1.52, 8.69)	0.004	
CAS with a partner who was not main/primary or whose HIV status was positive or unknown	153	33.8%	9.61 (5.89, 15.69)	<0.001			4.78 (2.63, 8.70)	<0.001	
Injection drug use	5	9.3%	0.38 (0.15, 0.97)	0.044			0.33 (0.09, 1.19)	0.092	
Methamphetamine use	10	13.5%	0.59 (0.30, 1.17)	0.130					
Poppers use	77	41.4%	4.18 (2.91, 6.01)	<0.001			1.91 (1.17, 3.13)	0.010	
History of exchange sex	1	3.1%	0.12 (0.02, 0.89)	0.038			0.32 (0.03, 3.02)	0.321	
Perceived effectiveness of PrEP 90%	153	36.0%	11.39 (6.97, 18.61)	<0.001			4.83 (2.62, 8.89)	<0.001	

Acronyms: OR, odds ratio; CI, confidence interval; aOR, adjusted odds ratio; CAS, condomless anal sex; PrEP, pre-exposure prophylaxis

<sup>a</sup>This analysis is restricted to respondents who have never or are currently using PrEP and provided responses to all covariates;

<sup>b</sup>The base model includes only *a priori* covariates (region, age, education, race/ethnicity, sexual orientation, income, and PrEP candidacy based on Washington state guidelines);

<sup>c</sup>The exploratory model includes base model social and demographic variables and exploratory variables that were significant in bivariate analyses. The Washington state PrEP guideline category variable was not included in the exploratory model because it is derived from the specific HIV risk indicators included as exploratory covariates;

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MSM who do not meet criteria for recommending PrEP and who reported CAS with a partner who is not main/primary, CAS with an HIV-positive or unknown status partner, diagnosis of urethral gonorrhea or rectal chlamydia, or injection drug use in the past 12 months, and those in ongoing sexual relationships with HIV-positive male partners who have been on ART < 6 months and who are virologically suppressed;

MSM who reported a diagnosis of rectal gonorrhea or syphilis, use of methamphetamine or poppers, or history of exchange sex in the prior 12 months, and those in ongoing sexual relationships with HIV-positive male partners who are not on ART, on ART < 6 months, or not virologically suppressed.