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## Pre-exposure Prophylaxis (PrEP) Awareness and Use Among Cisgender Men Who Have Sex With Men (MSM) and Use Methamphetamine in Three Western US Cities

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### Abstract

**Background:** In the United States, cisgender men who have sex with men (MSM) who use methamphetamine are at substantial risk of HIV and can benefit from pre-exposure prophylaxis (PrEP).

**Methods:** We used data from the National HIV Behavioral Surveillance (NHBS) 2017 survey from Seattle, WA; Portland, OR; and Denver, CO to estimate PrEP awareness and use in the past 12 months among MSM who use methamphetamine. We then compared these estimates to participants who do not use methamphetamine but meet other criteria for PrEP use (i.e., condomless anal sex or a bacterial sexually transmitted infection). We explored reasons for not using PrEP and challenges using PrEP.

**Results:** Of the 1,602 MSM who participated in the 2017 NHBS survey in Seattle, WA; Portland, OR; and Denver, CO, 881 met inclusion criteria for this study, of whom 88 (10%) reported methamphetamine use in the past 12 months. Most (95%) participants had heard of PrEP, and 35% had used it in the past 12 months. PrEP awareness was lower among MSM who used methamphetamine ( $p=.01$ ), but use was not different ( $p=.26$ ). Among those who had not used PrEP, the most common reason for not using it was not thinking one's HIV risk was high enough (50%). MSM who used methamphetamine were more likely to report that they were not sure PrEP would prevent them from getting HIV (38% vs 19%,  $p=.002$ ).

**Conclusions:** These results highlight the need for continued efforts to educate and promote PrEP uptake among MSM, particularly those who use methamphetamine.

## SUMMARY

Survey results from three cities showed only 35% of PrEP-eligible cisgender men who have sex with men had used PrEP. Awareness and belief in PrEP efficacy were lower among methamphetamine users.

## Keywords

HIV prevention; pre-exposure prophylaxis; methamphetamine; National HIV Behavioral Surveillance (NHBS)

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## INTRODUCTION

Daily, oral pre-exposure prophylaxis (PrEP) with emtricitabine/tenofovir disoproxil fumarate is a highly effective strategy for preventing HIV that was approved by the U.S. Food and Drug Administration in 2012.(1, 2) PrEP is most effective at the population level when used by those at elevated HIV risk.(3) In the U.S., cisgender men who have sex with men (MSM) have the highest number of new HIV diagnoses, (4) and methamphetamine use among MSM is associated with HIV risk behaviors (5, 6) and incidence. (7)

Despite elevated risk for HIV, MSM who use methamphetamine have had limited PrEP uptake. In a survey we conducted in 2016 of 221 MSM in Seattle, WA who used methamphetamine, 96% had heard of PrEP, but only 3% had used it. (8) The present study builds on this work by estimating PrEP awareness and use in a different sample of MSM in Seattle, WA and two other cities where MSM are disproportionately impacted by HIV infection (9) and methamphetamine use is prevalent. (10) Our hypothesis was that PrEP awareness and use would be lower among respondents who use methamphetamine based on our previous work.

We used data from the National HIV Behavioral Surveillance (NHBS) 2017 survey (9) from Seattle, WA; Portland, OR; and Denver, CO to estimate PrEP awareness and use in the past 12 months among MSM who use methamphetamine and compared it to estimates among participants who do not use methamphetamine. We explored reasons for not using PrEP among respondents who had not used it in the past 12 months, as well as challenges using PrEP among those who had used it in the past 12 months. Estimating PrEP use among MSM who use methamphetamine and understanding reasons for not using PrEP can inform efforts to increase PrEP use among persons at high risk for HIV acquisition.

## MATERIALS AND METHODS

### Data Source

The data included in this analysis were collected between June and December 2017 during the 5<sup>th</sup> NHBS-MSM cycle (9) in Seattle, WA; Portland, OR; and Denver, CO using a cross-sectional, in-depth behavioral survey. Participants were recruited using venue-based time-space sampling informed by a formative research phase that identified venues and times to

best recruit MSM. (11) Eligibility criteria for the NHBS-MSM survey included self-reported age 18 years or older, cisgender male identity, residence within the designated project area, ability to complete the survey in English or Spanish, and reporting ever having oral or anal sex with a man. All survey participants provided verbal consent and were offered optional HIV testing. The survey was administered verbally and was anonymous. Participants were provided a \$25 (Denver, CO) or \$50 (Seattle, WA and Portland, OR) incentive for the survey and \$25 for the HIV test.

In Seattle, WA and Portland, OR, NHBS has been designated as a surveillance activity and data collection activities are not subject to further institutional review board (IRB) review. In Denver, CO, NHBS activities are designated as research, and all activities were approved by the Colorado Multiple IRB (protocol # 11-0047). The University of Washington Human Subjects Division determined that secondary analyses presented here were not human subjects research and did not require review.

### Study Sample

We used PrEP eligibility criteria adapted from CDC practice guidelines to create a study sample eligible for PrEP (Figure 1).(12) First, we restricted our analysis to NHBS participants who reported three of the adapted CDC PrEP criteria: never tested positive for HIV, had 1 male sex partner in the past 12 months, and not in a monogamous relationship with an HIV-negative man. Participants who met these criteria were divided into two groups: those who had used methamphetamine in the past 12 months [consistent with local PrEP eligibility criteria (13)] and a control group who had not used methamphetamine but reported other PrEP eligibility criteria (i.e., condomless anal sex (CAS) with a man or diagnosis of a bacterial sexually transmitted infection (STI) in the past 12 months).

### Measurements

The NHBS survey included a core survey that was identical across sites and a local questionnaire customized by each site. We used data from core survey questions that asked about demographics, sexual behavior, drug use, HIV testing experiences, and HIV prevention activities including PrEP. We added four questions to three local surveys that assessed reasons for not using PrEP and challenges using PrEP.

**Demographic Characteristics**—Demographic characteristics included NHBS site, age (continuous), sexual identity (Heterosexual or “Straight,” Homosexual or Gay, or Bisexual), race (American Indian or Alaskan Native, Asian, Black or African American, Native Hawaiian or Other Pacific Islander, White, or Multiracial), ethnicity (Hispanic or non-Hispanic), highest level of education (less than high school, high school or equivalent, some college, bachelors, post-graduate), homelessness [defined as “living on the street, in a shelter, in a Single Room Occupancy hotel (SRO), or in a car” in the past 12 months (yes, no)], and health insurance (insured or not).

**Sexual Behavior**—Questions about sexual behavior in the last 12 months defined the study sample. All participants in the sample reported 1 male sex partner. We excluded participants in a monogamous relationship with an HIV-negative man. Since participants

were not explicitly asked if they were in a monogamous relationship, we used answers to two separate questions to define this criterion: reporting anal sex with only one HIV-negative male partner and that their partner “definitely did not” have sex with other people. We also calculated the total number of male CAS partners across four questions that assessed CAS with main and casual partners.

**Health Conditions**—We excluded people who had previously received a positive HIV test result. Participants were asked “in the past 12 months, has a doctor or other health care provider told you that you had (gonorrhea/chlamydia/syphilis).” Each STI was assessed in a separate yes/no question.

**Methamphetamine Use**—Three core survey questions asked about methamphetamine use. Participants were asked about frequency of non-injection methamphetamine use in the past 12 months (“never,” “once a week or less,” “more than once a week,” “once a day,” and “more than once a day”). Additionally, people who reported injecting drugs in the past 12 months were asked which drug they injected most often and which other drugs they injected. Participants were included in the methamphetamine group if they reported non-injection methamphetamine (i.e., any response other than “never”) or injecting methamphetamine in the past 12 months.

**PrEP Measurements**—We used data collected across eight survey questions about PrEP, including if participants had ever heard of PrEP and, among those who had, if they had a discussion with a health care provider about taking PrEP or had used PrEP in the past 12 months. Participants who had used PrEP were asked what challenges they experienced using it and those who had not taken PrEP were asked reasons for not using PrEP. Participants who had used methamphetamine were provided two additional answer options: “PrEP would not be safe to use while I am using meth” and “I think meth might make PrEP not work as well.” These answer options were informed by our formative work (8). Some participants were inadvertently asked the incorrect question about reasons for not using PrEP or asked both with the correct question asked second; in these cases the responses to the methamphetamine-specific question were considered missing.

## Statistical Analysis

**PrEP Cascade**—We assessed differences in covariates and the proportions who had heard of PrEP, discussed it with a provider in the past 12 months, or used it in the past 12 months across participants who had used methamphetamine compared to those who had not using chi-square tests for categorical variables (with Fisher’s exact tests for expected cell frequencies of <5) and Kruskal-Wallis tests for continuous variables. We then used a multivariable regression model with a log link and Poisson distribution to assess the association between methamphetamine use and PrEP use in the past 12 months after adjusting for potential confounders. We adjusted for project site, age, ethnicity, sexual identity, highest level of education, and homelessness in the prior year. These covariates were chosen a priori based on associations with methamphetamine use (14, 15) and PrEP awareness and uptake in other settings. (16–18) Because the proportion of participants who had any CAS with a man in the past 12 months was significantly different across groups

defined by methamphetamine use, we performed a second, post-hoc, multivariable regression that included any male CAS partners in the past 12 months compared to none.

**Reasons for not using, and challenges to using, PrEP**—We compared the frequencies of reasons participants had not used PrEP in the past 12 months and challenges using PrEP across groups defined by any methamphetamine use using chi-square tests.

All statistical analysis were conducted in Stata Version 12 (StataCorp, College Station, TX). Significance was defined as a p-value <.05.

## RESULTS

Of the 1,602 MSM who participated in the 2017 NHBS survey in Seattle, WA; Portland, OR; and Denver, CO, 1,135 (71%) were HIV-negative men who reported not being in a monogamous relationship with an HIV-negative man and oral or anal sex with a male partner in the past 12 months. Among these 1,135 participants, we excluded 254 participants who did not report methamphetamine use, a bacterial STI, or CAS in the past 12 months. Of the remaining 881 participants, 88 (10%) reported methamphetamine use in the past 12 months. Of the 793 who did not report methamphetamine use, 770 (97%) reported CAI and 187 (24%) reported a bacterial STI in the past 12 months.

The demographic characteristics are shown in Table 1. A greater proportion of participants who reported methamphetamine use were from Seattle, WA; (49%) than Denver, CO; (28%) or Portland, OR (23%) ( $p=.007$ ). Sexual identity was significantly different across groups ( $p<.001$ ), with more participants who used methamphetamine reporting bisexual identity (22% vs 15%) or heterosexual/“straight” identity (6% vs 0%). A smaller proportion of participants who used methamphetamine were Hispanic/Latinx (9% vs 21%,  $p=.008$ ). Participants who reported methamphetamine use had fewer years of education ( $p<.001$ ) and were more likely to report homelessness during the past 12 months (35% vs 4%,  $p<.001$ ).

Of 88 participants who used methamphetamine, 24 (27%) injected it in the past 12 months, and, of those, three participants reported using methamphetamine only via injection. Of the 85 (97%) who reported using methamphetamine through non-injection methods, six (7%) used it more than once a day, five (6%) used it once a day, eight (9%) used it more than once a week, and 66 (78%) used it once a week or less.

### PrEP Awareness and Use

Nearly all participants had heard of PrEP (833, 95%), most had discussed it with a medical provider in the past 12 months (480, 54%), and about one-third of participants had used PrEP in the past 12 months (308, 35%). Fewer participants who had used methamphetamine had heard of PrEP (89% versus 95% among participants who had not used methamphetamine,  $p=.01$ ). However there were no significant differences comparing proportions of participants who had discussed PrEP with a healthcare provider (47% vs 55%,  $p=.12$ ) or used PrEP in the past 12 months (30% vs 36%,  $p=.26$ ). (Figure 2) In multivariable analysis, methamphetamine use was not significantly associated with PrEP use in the past 12 months, with an adjusted prevalence ratio of 1.07 (95% CI: 0.70–1.65,  $p=.74$ ).

In the post hoc multivariate regression that included any CAS with a male partner in the past 12 months, there was also no differential PrEP use across groups (APR: 1.10, 95% CI: 0.72–1.70,  $p=.65$ ).

### Reasons for Not Using PrEP

Table 2 shows reasons participants were not using PrEP among those who had heard of PrEP, by group. The most common reason for not using PrEP was “I don’t think my risk for HIV is high enough to be on PrEP” (54% among participants who had used methamphetamine and 51% among those who had not,  $p=.68$ ). The second most common reason among both groups was “I worry about the side effects” (42% versus 48%,  $p=.40$ ). Among participants who used methamphetamine, the third most common reason was “I am not sure it would prevent me from getting HIV” (38%). Being unsure of PrEP’s effectiveness was reported by a significantly higher proportion of participants who had used methamphetamine (38% vs. 19%,  $p=.002$ ).

Among the 24 participants who had used methamphetamine in the past 12 months and were asked the reasons they had not used PrEP specific to methamphetamine use, three (13%) said “PrEP would not be safe to uses while I am using meth” and six (25%) said “I think meth might make PrEP not work as well.”

### Challenges Using PrEP

Among the 308 participants who had taken PrEP in the past 12 months there was no significant difference in challenges taking PrEP comparing those who had used methamphetamine (26, 8%) and those who had not used methamphetamine (282, 92%) in the past 12 months (Table 3). The most common responses were not experiencing any challenges (31% among participants who had used methamphetamine and 29% among those who had not,  $p=.83$ ) and that “it is hard to remember to take a pill every day” (31% versus 23%,  $p=.38$ ).

## DISCUSSION

MSM who use methamphetamine are disproportionately impacted by HIV in western U.S. cities and should be a priority population for PrEP. In this analysis of the 2017 NHBS MSM survey from Seattle, WA; Portland, OR; and Denver, CO, we found that while nearly all PrEP-eligible MSM had heard of PrEP, significantly fewer MSM who used methamphetamine had heard of it. In addition, not believing that PrEP would be effective in preventing HIV was reported by a significantly larger proportion of respondents who used methamphetamine. Increasing PrEP awareness among MSM who use methamphetamine as well as providing accurate information about PrEP’s effectiveness is needed. In an earlier PrEP educational intervention we developed targeted to MSM who use methamphetamine in Seattle, WA, we found that there was a trend between seeing local educational materials and PrEP use,(8) indicating that, in addition to increasing PrEP awareness, targeted educational materials may also impact uptake among MSM who use methamphetamine.

Consistent with findings in other PrEP continuums among MSM,(19, 20) only a portion of those who had heard of PrEP had discussed it with a health care provider in the past 12

months, and even fewer had used it. The decreases across the PrEP continuum, which were slightly steeper among MSM who used methamphetamine, highlight the need for increasing provider discussions about PrEP to improve PrEP uptake. The majority of the sample who had not used PrEP reported they were not using it because they did not think their risk for HIV is high enough even though everyone in the sample met eligibility for PrEP. Low risk perception has been a barrier in other settings where MSM meet criteria for PrEP use.(21–23) Approximately one-third of our sample had used PrEP in the past 12 months, which was similar to the prevalence of PrEP use in the national NHBS survey sample and is an increase since 2014.(24) However, considering that everyone in this sample met PrEP eligibility criteria, only one-third reporting past-year use highlights gaps in PrEP provision.

The similar proportion of PrEP use in the past 12 months that we found among those who had used methamphetamine and those who had not was inconsistent with prior data among MSM in Seattle, WA (8) and our hypothesis that methamphetamine use would be a barrier to PrEP uptake. We think that this may be due to two factors: first, PrEP use has been increasing in the U.S.,(24) and it is possible that MSM who use methamphetamine have had increased uptake as PrEP has become more available. Alternatively, it is possible that this sample does not include a substantial number of MSM who use methamphetamine who are at the highest risk of HIV acquisition.

In formative work we did among MSM who use methamphetamine in Seattle, WA, which was recruited by needle exchange peer educators, 85% reported using methamphetamine at least weekly, and only 3% reported using PrEP.(8) In the present analysis, only 22% of respondents who had used methamphetamine in the past 12 months used it weekly or more frequently and the remaining 78% may have used it only once in the prior year. Furthermore, less than one-third (27%) had injected methamphetamine in the past 12 months, which is a subgroup of MSM who use methamphetamine at even higher risk for HIV.(25) The frequency of methamphetamine use in the present study may impact the generalizability of findings across the broader population of MSM who use methamphetamine in Seattle, WA; Portland, OR; and Denver, CO. Moreover, since the frequency of methamphetamine use is not commonly collected in studies, associations between the frequency of use and HIV risk are understudied. While all MSM who use methamphetamine should be a focus of PrEP efforts, MSM who inject methamphetamine or are living homeless may be particularly vulnerable and require additional, unique outreach methods. This could include collaborating with organizations who already provide services to these groups (e.g., syringe services programs) or recruiting participants from certain venues where MSM who use methamphetamine may be more likely to be at higher risk for HIV (e.g., bathhouses).

This study has several limitations. First, all data are self-reported and may be impacted by recall or social desirability bias, especially considering questions were related to sensitive and illegal behaviors. However, the survey was administered anonymously by trained interviewers, which should have helped mitigate the effects of social desirability bias. Second, because we asked about PrEP use in the last 12 months and not current use or discontinuations, we could not measure if participants had persisted using PrEP and if persistence was lower among those who used methamphetamine, which has been seen in other settings.(26) Third, in some of our analyses, sample sizes were small, limiting

multivariable analyses. This included only a subset of the participants (n=24) who used methamphetamine being asked the question about reasons they had not used PrEP that had methamphetamine-specific barriers. While we were unable to assess these methamphetamine-specific barriers across the whole sample of participants who used methamphetamine but had not used PrEP, these 24 participants were not significantly different from other participants who used methamphetamine, with the exception of study site, since the administrative error was site-specific. We did, however, collect detailed information regarding reasons PrEP-eligible MSM were not using PrEP and challenges using it among a large sample of MSM. Finally, these results may not be generalizable outside of this sample, especially among groups that may report higher risk for HIV or more frequent methamphetamine use or use other substances. Our findings also may not reflect MSM in other geographic locations; however, methamphetamine use is less prevalent among MSM in other parts of the U.S.(27) Future research should measure PrEP awareness and use among different subgroups of people who use methamphetamine that may be at higher risk for HIV, including transgender persons, (28) persons living homeless, sex workers, and MSM who inject drugs.(25, 29, 30)

## CONCLUSIONS

In conclusion, we found that participants who used methamphetamine had significantly lower PrEP awareness and belief in PrEP effectiveness. Participants who had not used PrEP but met eligibility criteria reported low HIV risk as their primary reason they had not used PrEP. While there was no significant difference of PrEP use in the past 12 months comparing participants who had used methamphetamine to those who had not, only about one-third of MSM meeting PrEP eligibility criteria had used it in the past 12 months. Our research highlights the need to educate and promote PrEP uptake among MSM who are at elevated risk for HIV, including those who use methamphetamine. Efforts to increase PrEP uptake could include offering PrEP at locations or by organizations that already engage MSM who use methamphetamine.

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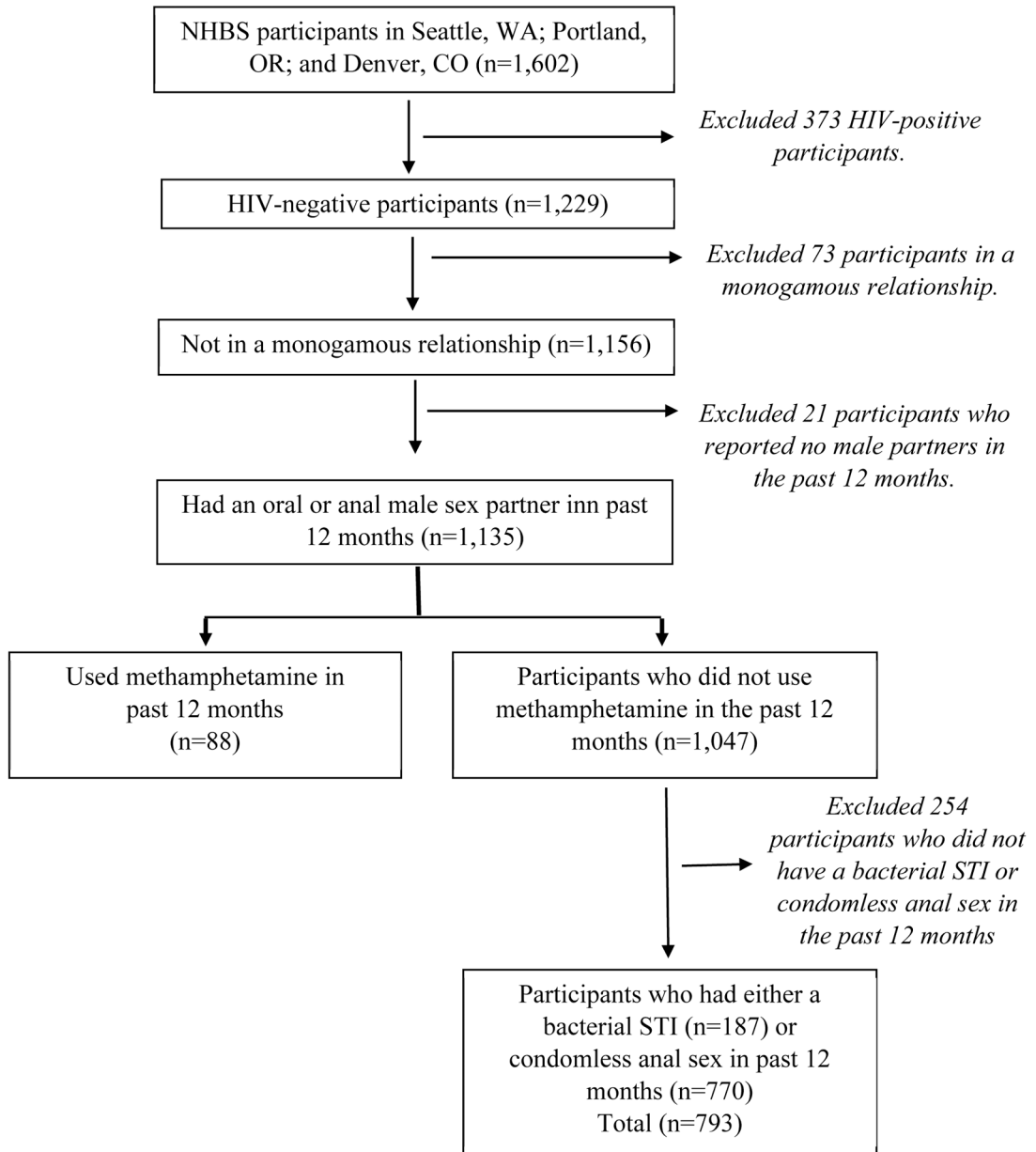
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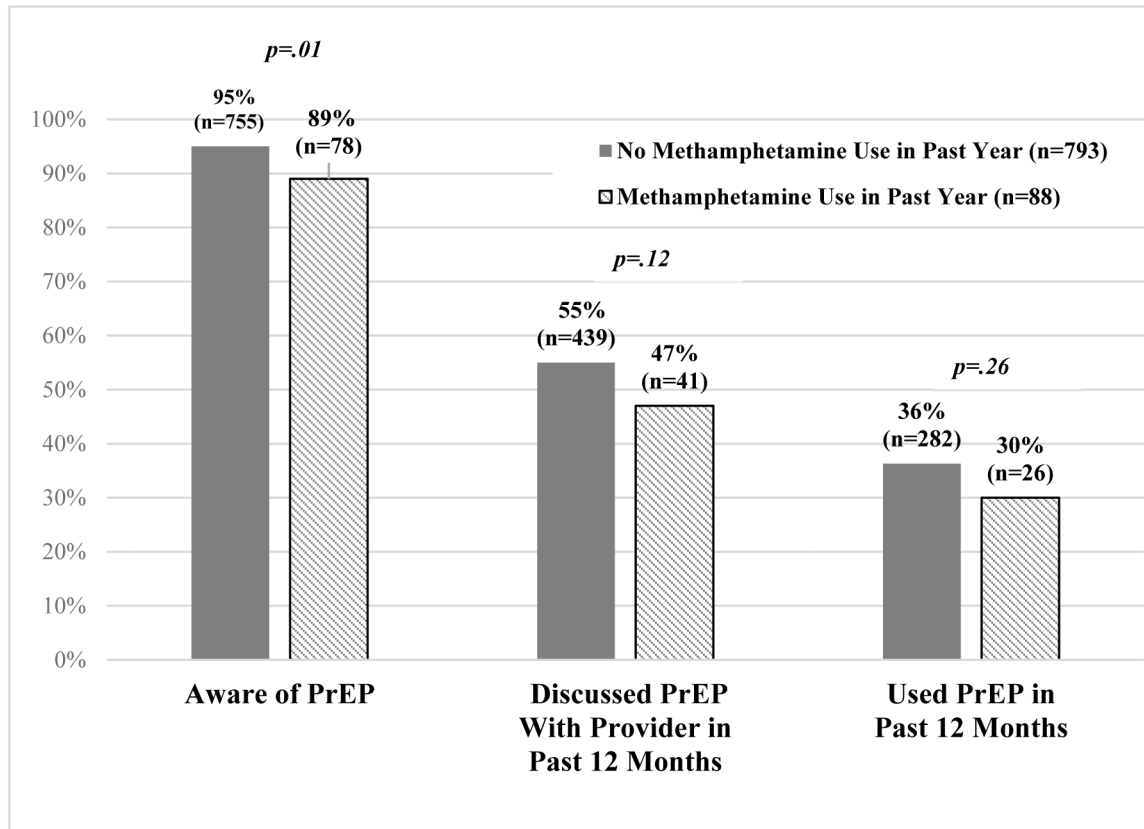


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**Figure 1.** Flowchart of the Analytical Selection Process Using Adapted CDC PrEP Criteria Among NHBS 2017 MSM Survey Respondents in Seattle, WA; Portland, OR; and Denver, CO



**PrEP Continuum**

**Figure 2.** PrEP Awareness, Discussions with Providers in Past 12 Months, and Use in Past 12 Months Among NHBS 2017 MSM Survey Respondents in Seattle, WA; Portland, OR; and Denver, CO Who Met Adapted CDC PrEP Eligibility Criteria, by Methamphetamine Use in Past 12 Months (n=881)

**Table 1.**

Demographic Characteristics Comparing NHBS 2017 MSM Survey Respondents in Seattle, WA; Portland, OR; and Denver, CO Who Met Adapted CDC PrEP Eligibility Criteria by Past 12 Months Methamphetamine Use (N=881)

Characteristics <sup>f</sup>	Methamphetamine Use in Past Year (n=88)		No Methamphetamine Use in Past Year (n=793)		P-value
	n	(%)	n	(%)	
<b>Site</b>					
Denver	25	28%	299	38%	.007
Portland	20	23%	240	30%	
Seattle	43	49%	254	32%	
<b>Age (median, IQR)</b>	32	(28–38)	32	(26–41)	.91
<b>Sexual identity</b>					<.001
Heterosexual or “straight”	5	6%	2	0%	
Homosexual or Gay	64	73%	670	84%	
Bisexual	19	22%	119	15%	
<b>Race</b>					.50
American Indian or Alaska Native	1	1%	24	3%	
Asian	1	1%	28	4%	
Black or African-American	6	7%	51	6%	
Native Hawaiian or Other Pacific Islander	1	1%	7	1%	
White	61	69%	584	74%	
Multiracial	13	15%	80	10%	
<b>Ethnicity</b>					.008
Not Hispanic/Latinx	79	90%	625	79%	
Hispanic/Latinx	8	9%	167	21%	
<b>Highest Level of Education Completed</b>					<.001
< 12 Grade 12	7	8%	5	1%	
Grade 12 or GED	25	28%	124	16%	
Some college, AA, or Tech	38	43%	254	32%	
Bachelors degree	16	18%	261	33%	
Any post-grad	2	2%	149	19%	
<b>Homeless</b>					<.001
Homeless in past year	31	35%	34	4%	
<b>Health insurance</b>					.044
Currently have health insurance	70	80%	692	87%	

<sup>f</sup>There were 2 missing values for sexual identity and ethnicity and 24 missing values for race.

**Table 2.** Reasons Participants Had Not Used PrEP in the Past 12 Months Among NHBS 2017 MSM Survey Respondents in Seattle, WA; Portland, OR; and Denver, CO Who Met Adapted CDC PrEP Eligibility Criteria and Had Heard of PrEP, by Past 12 Months Methamphetamine Use (n=525)

Reasons Participants Were Not Using PrEP	Multiple Answer Options Permitted <sup>‡</sup>						P-value
	Participants Who Had Used Methamphetamine in the Past 12 Months (n=52)		Participants Who Had Not Used Methamphetamine in the Past 12 Months (n=473)		%	n	
I don't think my risk for HIV is high enough to be on PrEP	27	54%	233	51%			
I worry about the side effects	21	42%	220	48%			.40
I am not sure it would prevent me from getting HIV	19	38%	89	19%			.002
I don't think I can afford it	18	36%	168	37%			.92
I don't know enough about PrEP	17	34%	138	30%			.57
I don't know where to get PrEP	15	30%	127	28%			.73
I would need to take a pill every day	13	26%	120	26%			.98
Seeing a provider every 3 months is too much trouble	10	20%	70	15%			.39
Other reasons(s)	8	15%	93	20%			.47
I worry about being judged for using PrEP	7	14%	35	8%			.12
					0	0%	2
					0	0%	0
							.64

<sup>‡</sup> Fifteen participants who had not used methamphetamine had missing data and two participants who had used methamphetamine in the past 12 months had missing data for both questions.

**Table 3.**

Challenges Using PrEP Among NHBS 2017 MSM Survey Respondents in Seattle, WA; Portland, OR; and Denver, CO Who Met Adapted CDC PrEP Eligibility Criteria and Had Used PrEP in the Past 12 Months, by Past Year Methamphetamine Use (n=308)

Challenges Using PrEP Among Participants Who Had Used PrEP in the Past 12 Months	Participants Who Had Used Methamphetamine in the Past 12 Months (n=26)		Participants Who Had Not Used Methamphetamine in the Past 12 Months (n=282)		<i>p</i> -value
	n	%	n	%	
I haven't experienced any challenges taking PrEP	8	31%	81	29%	.83
It is hard to remember to take a pill every day	8	31%	65	23%	.38
Other reason(s)	7	27%	50	18%	.25
It is hard to make it to my clinic visits for refills	5	19%	33	12%	.26
I lost my insurance/can't afford it anymore	4	15%	30	11%	.51
I have experienced side effects	2	8%	51	18%	.28
I don't think my risk for HIV is high enough to be on PrEP	2	8%	27	10%	1.0