

**PrEP AWARENESS IN MEN WHO HAVE SEX WITH MEN (MSM) AND
TRANSGENDER WOMEN WHO SOUGHT SERVICES FROM THE ALLEGHENY
COUNTY HEALTH DEPARTMENT HIV/STD CLINIC, 2016-2017**

by

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ABSTRACT

In 2016, the estimated total of new HIV infections was 39,782 in the United States. The majority of these cases occurred among men who have sex with men (MSM). In 2014, 74.6% of diagnosed HIV cases in Allegheny County were among MSM. 852 per 100,000 Black individuals were living with diagnosed HIV compared to 131 per 100,000 White individuals in 2014 for the county. In 2016, there were 127 new HIV cases diagnosed within the county. In 2012, the Food and Drug Administration (FDA) approved Truvada to be used for HIV as pre-exposure prophylaxis (PrEP). This drug is an efficacious prevention method to protect from HIV infection. Previous research shows low awareness of PrEP in all MSM communities, particularly in Black MSM. Research also shows an association with higher levels of sexually transmitted infections (STIs) and HIV seroconversion and in the United States, MSM carry the burden for STIs as well. Therefore, it is a prominent public health issue and individuals seeking care for STIs need to become aware of PrEP. Awareness of PrEP is a first stepping stone into rolling out this new prevention measure and stopping new HIV cases from within the MSM population.

This study aims to provide insight into PrEP awareness in Allegheny County, PA among MSM, transgender women, and gender non-conforming individuals who were assigned a sex of

male at birth seeking services at the Allegheny County Health Department (ACHD) HIV/STD clinic.

In 2016 and 2017, 191 MSM in Allegheny County, PA were surveyed at the ACHD HIV/STD clinic about their PrEP awareness. 84% of this population had heard about PrEP. Compared to 18-25-year-old individuals, those 55+ were significantly less likely to be aware of PrEP (aOR = 6.32; 95% CI: 1.13, 35.21). No other demographic was statistically significant in this analysis, including year survey was taken, self-reported perceived risk of HIV infection, gender, and sexual orientation.

Findings suggest that overall this population had a high level of PrEP awareness compared to past research. Future interventions should be focused on older age. More research is needed as PrEP awareness is just the beginning of PrEP implementation into a community. Further research should be done to assess PrEP adherence and long-term continuation, barriers and facilitators of PrEP uptake and use, and roles that HIV/STI clinics can serve in PrEP awareness and knowledge to further assist in reduction of new HIV cases within this population.

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PREFACE

I would like to thank the Jewish Healthcare Foundation and AIDS Free Pittsburgh for allowing me to use their PrEP survey data from 2016-2017 for my thesis. Without the help of their kind staff, specifically Julia Och and Ashley Chung, I would have never had the opportunity to learn so much about PrEP awareness and the community I spent two years becoming a part of.

I would also like to thank my committee members, Dr. Friedman, Dr. Krier, and Dr. Egan for their support and encouragement during my time as an MPH student, as well as their feedback and help in the writing process. Without them I would not have been able to flourish in this program the way that I have.

1.0 TODAY'S HIV LANDSCAPE IN THE UNITED STATES

The human immunodeficiency virus (HIV) and acquired immunodeficiency syndrome (AIDS) epidemic in the 1980s and 1990s involved a large number of new infections as well as deaths relating to HIV/AIDS. The World Health Organization (WHO) have estimated over 70 million individuals have been infected with HIV and about 35 million individuals have died all around the world from HIV since the epidemic began.¹ During the mid-1980's, the United States experienced an estimated 150,000 new cases of HIV per year.² With the introduction of antiretroviral therapy (ART) and other prevention efforts in the mid-1990s the number of deaths related to HIV/AIDS have been reduced.³ The Centers for Disease Control and Prevention estimated this number dropped to 40,000 new infections per year by 1992.² This trend continued and new cases have decreased overall 18% from 2008 to 2016 in the United States.⁴ Despite the overall decrease in annual HIV cases, new cases of HIV still occur.⁴ This means HIV remains a prominent public health issue in the United States as well as worldwide. In 2016, the estimated total number of new HIV infections was 39,782.⁴ These cases, however, were not spread evenly throughout the population. The majority, 67%, of these cases occurred within the community of men who have sex with men (MSM) in the year 2016, as shown in Figure 1 below.³ Certain subpopulations are disproportionately burdened with higher numbers of new HIV diagnoses than others.⁵ This could be due to socioeconomic status, education level, as well as many other social factors that contribute to lower health outcomes. Black MSM (BMSM) are steadily becoming the

New HIV Diagnoses by Transmission Category (2016, n=39,782)

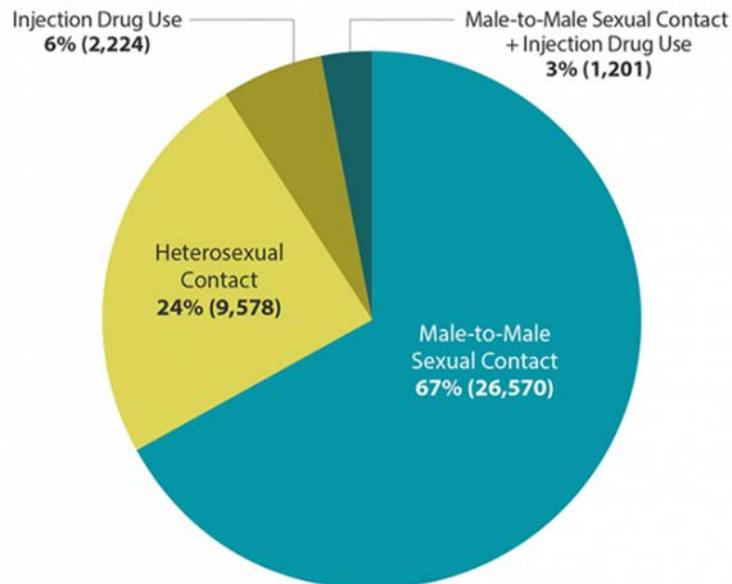


Figure 1: 2016 Estimated New HIV Infections

This graph shows that over 67% of all the new HIV cases occur in the MSM population, while other populations do not even account for 25% on their own. This creates a huge disparity within the MSM population that calls for action within the public health community.

most at-risk group for new HIV cases.⁶ In fact, they exceed other populations in new HIV cases by as few as 2,000 new cases to over 8,000 new cases as depicted in Figure 2 below.⁶ Hispanic/Latino MSM as well as white MSM are also at experiencing higher HIV infection rates than straight/heterosexual populations, but as can be seen they are still at much lower rates than Black MSM. With incidence rates affecting Black MSM, Hispanic MSM and MSM in general at higher proportions than other populations, new public health interventions need to be established and implemented in order to prevent future infections in these subgroups.

New HIV Diagnoses in the United States for the Most-Affected Subpopulations, 2016

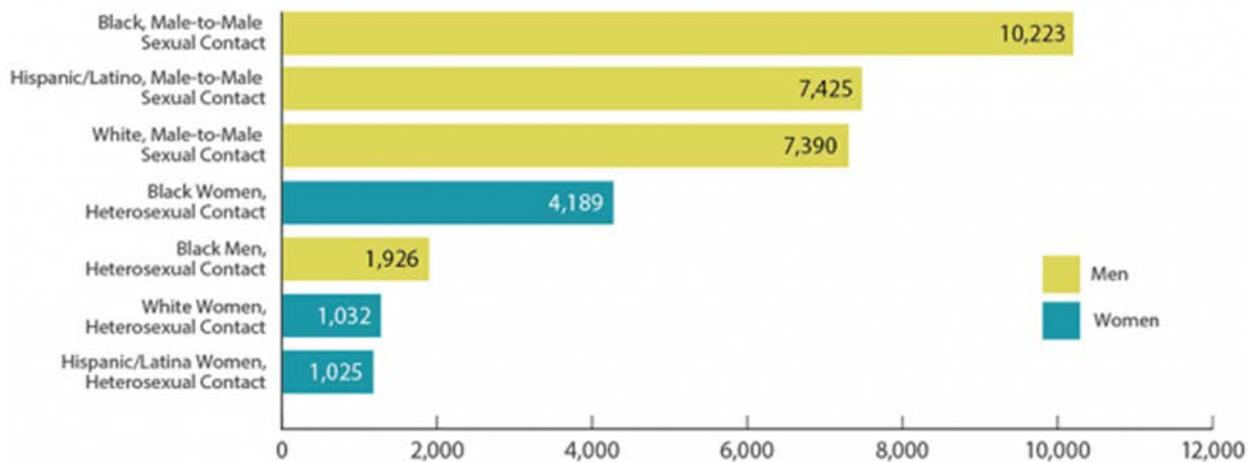


Figure 2: 2016 New HIV Infections broken down by Subpopulations

This figure depicts the breakdown of new HIV cases diagnosed in the United States in the year 2016. The BMSM subpopulation had the most HIV cases in 2016 (n=10,233) followed by Hispanic/Latino MSM (n=7,425) and White MSM (n=7,390).

1.1 WHAT IS PREP?

In 2012, the Food and Drug Administration (FDA) approved Truvada for use as pre-exposure prophylaxis (PrEP) for HIV.⁷ This drug can be used as a prevention method to stop HIV infection from occurring, and is most effective when used in tandem with other safer sex practices.⁷ It is currently recommended for individuals at high risk for contracting HIV.⁷ Those who engage in risky sexual behaviors, use injection drugs, and/or have an HIV-positive sexual partner are individuals who could possibly benefit most from PrEP. As MSM are the most at-risk subpopulation for HIV, it is of high importance to make every prevention method for HIV available and accessible to them.

1.1.1 Barriers to PrEP

PrEP, when taken as directed, can be over 90% effective at preventing a new HIV infection.⁷ However, like other medications, there are barriers that can affect adherence to PrEP. Among the highest priority is PrEP awareness which is defined as being aware of PrEP and that it can be taken to stop HIV infection. PrEP awareness, or rather lack of awareness, is the additive result of multiple barriers that will need to be addressed in order to increase awareness and uptake.⁸ A large barrier to PrEP awareness is lack of communication information and relay of information from scientific and research communities to the public.⁹ Bridging this gap could strengthen awareness and speed up the dissemination of scientific information into the public. Another barrier to PrEP is the cost of Truvada. Those who have had prior sexually transmitted infections as well as those who are uninsured have been shown to have a concern for the cost associated with Truvada.¹⁰ Stigma against being on PrEP can also be a barrier.⁸ This may be due to one transmission mode of HIV being sexually transmitted and the belief of an association between being on PrEP and promiscuity. This stigma towards PrEP and those on PrEP can come outside communities as well as inside the Lesbian, Gay, Bisexual, and Transgender (LGBT) community.⁸ Perhaps, the most salient barrier, which has been identified by multiple studies, relates to health consequences of PrEP use. These include short term side effects^{10,11} as well as a potential fear individuals have for long term health consequences.¹¹ In one study, African Americans and Latinos were more likely to choose not to initiate PrEP if there were potential side effects of the drug compared to their white counterparts participating in the survey.¹⁰ This fear of health consequences could be rooted in long term fear and lack of trust towards the medical community by vulnerable populations who have been previously exploited in health settings.¹⁰ Considering this history of abuse and exploitation of these vulnerable populations by

medical professionals could be an important factor when addressing specific populations and creating new interventions.

1.2 OVERALL AWARENESS OF PREP IN MSM COMMUNITIES IN THE UNITED STATES

The FDA approval of Truvada for PrEP over five years ago has slowly increased the use of this prevention method. Despite this increase in uptake, PrEP awareness is still low, especially in some subpopulations¹², specifically MSM and Black/African American MSM. Previous research from 2012-2015, conducted in several cities with diverse populations represented, shows low awareness of PrEP in all MSM communities overall.^{8,9,10,11,12,13,14} Levels of PrEP awareness range widely among cities and their sample populations but never reach above an average of 39% awareness. These levels of PrEP awareness do appear to be increasing overtime. However, more research is needed that can inform interventions to help extremely vulnerable populations at risk of HIV.

Krakower, et. al., (2012) recruited participants from 2010-2011 using an online social networking site specifically catered toward MSM to participate in a study around PrEP uptake. 82.1% of the participants were white, more than 99% self-identified as gay or bisexual, were highly educated with 92.6% continuing education after high school, and 63.3% were employed full-time with one third of them earning \$60,000 or more a year. This study surveyed participants before and after the iPrEx trial published their findings and found that the overall awareness of PrEP increased from 12.5% pre-iPrEx to 19% post-iPrEx, which is about one in five participants in the study that were aware a PrEP.¹³

In comparison, a study by Bauermeister et. al., (2014) showed that in a population of young MSM (YMSM) between the ages of 18-24, 27.2% were aware of PrEP. This sample was selected based on their use of online websites to meet male partners for sex or dating purposes surveyed YMSM from July 2012 to January 2013. They recruited US resident 18-24-year-old self-identifying as single males who had ever gone online to meet a male partner for sex or dating purposes.¹⁰

A study conducted in New York City in 2013 specifically targeted MSM 16 years or older, living in the Bronx area, and had anal sex in the previous year. They found an overall PrEP awareness of 34% within their population.¹⁴ Of those who were aware 92% had received an HIV test at least once in their lifetime. Of those who had received an HIV test, 67% were non-White. Reported PrEP awareness was then further broken down by race: 40% of White individuals were aware while only 28% of both Black and Hispanic individuals were aware of PrEP.¹⁴ These higher rates of PrEP awareness may also be due the study being completed in later years, but also might have an association with having been tested for HIV as later discussed is a huge factor in PrEP awareness.

Garnett, et al., (2018) performed a study focusing on Black MSM (BMSM) and transgender women in New York City from July 2012 to April 2015. This study was unique in that it used data conducted by the Substance Treatment and Research Service (STAR) study from the National Institute on Drug Abuse. This study gave valuable insight into a vulnerable population that has a history of drug use. Garnett et. al. found lower than usual rates of PrEP awareness at an average of 18% in their sample.¹² This may be explained by the population in the study showing that drug use and abuse may be correlated with poorer health outcome and specifically lower levels of PrEP awareness.

Eaton, et al., (2015) recruited participants from January 2012 to March 2014 in cities such as gay bars, clubs, bathhouses, parks, streets and online who were 18 years of age or older, HIV negative, and reported condomless anal sex in the past year. 22% of their entire sample had heard of PrEP. PrEP awareness ranged from 20.5% before the approval of PrEP, to 23.4% six months after PrEP was approved by the FDA, to 15.2% in 2014. While they saw a rise in PrEP awareness from before the FDA approved Truvada to after, they concluded that there was no evidence that PrEP awareness was increasing in the BMSM community.⁹

From April to September, 2014, Eaton, et al. (2017), recruited a target population of BMSM and Black transgender females who were 18 years of age or older, and had sex with a man at least once. These participants were recruited from out a Black gay pride events in Philadelphia, PA, Houston, TX, Washington, District of Columbia (DC), and Detroit, MI. Results indicated that 39% of those surveyed had heard of PrEP, with participants from DC having the highest level of PrEP awareness.⁸

1.3 CORRELATES OF PREP AWARENESS

Different factors are associated with awareness of PrEP. These include being older in age, higher than high school level education, higher than average income, self-identification as LGBT and/or being “out” to others about their sexual orientation and having had an HIV test at least once in their lifetime (usually within the previous six months prior to the research study).^{8,9,12,14,15} Having had an HIV test was significantly associated with PrEP awareness in multiple studies.^{8,9,12,14,15} This is a potential indicator of how PrEP information is disseminated throughout communities. Public health interventions seeking to improve PrEP awareness have

the opportunity to capitalize on HIV testing sites and organizations to disseminate information and/or use them as PrEP implementation sites. The creation and improvement of PrEP interventions could benefit greatly from studying these strong correlations between HIV testing sites and PrEP awareness.

There also are other factors associated with increased PrEP awareness. Garnett, et al., (2018) found an association between higher numbers of sex partners and increased PrEP awareness.¹² However, Eaton, et al., (2015) did not observe a significant difference in PrEP awareness versus non-PrEP awareness in relation to a participant's self-reported number of sex partners.⁹ Low levels of condomless sex or higher levels of sex with a condom,^{8,9} lower levels of engagement in receptive anal sex with a partner of unknown HIV status,⁹ having had at least one sexually transmitted disease before,¹⁰ currently being in a relationship,⁸ and having health insurance¹⁰ have all been associated with higher rates of PrEP awareness.

Interestingly, participants of the same study who self-identified as bisexual were more likely to have heard of PrEP compared to those who self-identified as gay.¹³ Also, for participants who self-identified as bisexual, the greater the number of female partners, the more likely they were to be aware of PrEP.⁸ This could be due to a fear of being exposed as MSM or "outed" to those who do not already know the individual's sexual orientation.⁸ It could be related to internalized homophobia, which was found to be associated with an increase in PrEP awareness.⁸ In the case of lower levels of internalized homophobia, there was an associated decrease in PrEP awareness.⁸ Lower reports of externalized stigma towards the LGBT community¹² and higher reports of resiliencies⁸ were positively associated with PrEP awareness. This could be due to having a support system that identifies similarly to the individual and being

able to manage mental health setting up a positive situation for them to be able to get the appropriate care needed.

It is important to observe how aware MSM are of PrEP, as well as, understand whether they are willing and likely to take PrEP, to better understand what new interventions need to be created to cater to this community to be able to effectively reach them. Krakower, et al., (2012) saw a low rate of PrEP awareness; however, after informing participants of PrEP, their interest increased. In fact, the majority of participants showed an interest in PrEP after being educated. This interest was correlated with older ages, perception of HIV risk, or having unprotected anal intercourse with at least one male in the past three months.¹³ This information shows a gateway towards starting the conversation and potentially getting individuals at high risk for HIV started of PrEP.

1.4 HIV IN PENNSYLVANIA AND ALLEGHENY COUNTY

In 2014 there were 33,593 people living with HIV in the state of Pennsylvania.¹⁶ Of these individuals living with HIV 71% of them were men and 48% were Black.¹⁶ In 2015, there were a total of 1,170 or 11 per 100,000 new HIV diagnosis in Pennsylvania.¹⁶ Allegheny County reported rates of 238 per 100,000 individuals living with diagnosed HIV in 2014.¹⁶ This makes Allegheny County the sixth ranked county in Pennsylvania for HIV cases in 2014. When focusing solely on men this number increases to 399 per 100,000 individuals living with diagnosed HIV.¹⁶ MSM in Allegheny County are shown to have even higher rates of HIV infection. In 2014, 75.6% of the total HIV cases were among MSM living with diagnosed HIV.¹⁶ 852 per 100,000 Black individuals were living with diagnosed HIV compared to 131 per 100,000

White individuals in 2014 for the county.¹⁶ While these number do not reflect new infections, they represent individuals in the community that are infected with HIV showing the disparity in the county. These individuals can also be a part of interventions to stop new infections from happening across Allegheny County.

1.5 PREP AWARENESS AMONG MSM IN PITTSBURGH, PA

There has been limited research conducted in Pittsburgh, or the larger area of Allegheny County, Pennsylvania around PrEP awareness, specifically among MSM. One study conducted by Dolezal, et al., (2015) surveyed 18-30-year-old MSM from Boston, MA, Pittsburgh, PA, and San Juan, PR. From 2010-2012, researchers recruited gay and bisexual men who reported receptive anal intercourse in the past month and at least one experience of condomless receptive anal sex within the past year. Of the 62 participants from Pittsburgh, only 19% of them had heard of PrEP. These participants were mostly White/Caucasian with only 25% of participants being African American, Latino, or mixed race. Of the participants from Pittsburgh, 85% self-identified as gay and 15% self-identified as bisexual, 30% reported ever having a sexually transmitted disease, which was the only statistically significant predictor of PrEP awareness other than study location. Pittsburgh participants were about five times more likely to have heard of PrEP than those in San Juan, but 5 times less likely than those in Boston. Dolezal, et al., (2015) explains that PrEP was a monumental development in the prevention and control of HIV but has little value if those at highest risk do not have the knowledge of this prevention option. They also identified health departments, health care providers, and community organizations as potential avenues to help spread awareness of PrEP.¹⁷ As shown above, these organizations may

be the most effective at having PrEP awareness programs because of their ability to provide HIV testing.

1.6 STI'S AND THEIR RELATIONSHIP WITH HIV SEROCONVERSION AMONG MSM

MSM make up only about 2% of the United States population¹⁹, but are carrying a large burden of sexually transmitted infections (STIs), specifically chlamydia, gonorrhea, and syphilis.²⁰ STIs increase risk of HIV,²¹ specifically syphilis, chlamydia, and gonorrhea are known to increase an individual's chance of acquiring HIV.^{22,23} This relationship has many contributing features including biological factors, such as sores that provide openings in epithelial protective layer and decreases in immune defenses, as well as behavioral factors, such as unprotected sex and multiple partners.²¹ STIs can also indicate unprotected sex which is another a risk factor for HIV.²⁰ STIs diagnosis is an objective and measurable marker, compared to self-reported measures of condom use or number of partners, that is associated with increased risk in HIV infection that should not be overlooked when creating interventions as identifying and treating these cases can have a downstream effect in reducing HIV cases in MSM.²¹ STIs increase the risk of HIV seroconversion in MSM populations, with repeat infections creating a much greater risk for this seroconversion.^{21,22,23,24,25} Repeat STIs infections can increase an individual's risk of HIV acquisition by as much as 8 times more than their MSM counterparts with single STI incidences.^{22,23} For many of these repeat STIs the time to reinfection is under a year.^{22,23} Catching repeat STI cases and treating them effectively will also help reduce the burden of HIV. Preventative care is needed and pulling efforts in public health to catch these STI cases

quickly to decrease transmission and ultimately combat HIV is urgent.^{21,22,24,26} Because of this research and the now known link between STIs, multiple STIs, and HIV seroconversion this study aims to specifically analysis PrEP awareness at the local HIV/STD clinic. Making a specific effort to ensure those seeking services at the clinic are aware of PrEP could help serve those at greater risk of a potential HIV infection.

HIV remains a significant public health issue in the United States today. HIV in Allegheny County is no exception, with the majority of the cases occurring in the MSM community.^{5,16} It is important to realize that PrEP can be an effective tool to prevent incident cases of HIV, but to be successful, at-risk populations need to first be aware of the option. After baseline PrEP awareness is established, more robust interventions can be implemented to increase adherence and long-term continuation.

The scope of this study is to assess PrEP awareness in Allegheny County among men who have sex, transgender women, and gender nonconforming individuals who were assigned a sex of male at birth. What is the level of PrEP awareness in this specific community in Allegheny County? Does awareness of PrEP change based on different demographics such as age, race, perceived risk of HIV infection, or sexual orientation? These results are intended to guide community organizations and other HIV prevention efforts in the area in creating tailored PrEP interventions for MSM in the community.

2.0 METHODS

This study, a serial cross-sectional analysis of survey data from AIDS Free Pittsburgh (AFP), was conducted in order to gain insight into PrEP awareness in Allegheny County, Pennsylvania among men who have sex with men, transgender women, and gender nonconforming individuals who were assigned a sex of male at birth. This anonymous, secondary data was provided by AFP and, involved no human subjects according to the federal regulations [§45 CFR 46.102(f)]. This study was exempt from IRB review (IRB#: PRO18020112).

AFP conducted a PrEP Awareness survey from May 5th to June 30th 2016 and then again from May 1st to October 31st 2017. They distributed the survey to several health organizations within Allegheny County to gain insight into the community's awareness of PrEP. Paper and electronic surveys were made available to several organizations to disseminate among their client and patient bases for completion. These organizations included the Allegheny County Health Department (ACHD) HIV/STD Clinic, Allegheny Health Choices Incorporated, Allies for Health + Wellbeing (previously Pittsburgh AIDS Task Force), Children's Hospital of Pittsburgh (CHP), Clinical and Translational Science Institute, Delta Foundation, Human Services Center Corporation-Mon Valley Providers Council (HSC), Latterman Clinic in McKeesport, Planned Parenthood of Western PA, PERSAD Center, Prevention Point Pittsburgh (PPP), University of Pittsburgh Health Fairs (Pitt Health Fairs), and the YMCA. Electronic surveys were also

circulated via AFP email and social media channels, and at Pittsburgh PrideFest. In provider practices and offices, the surveys were typically completed during their waiting time before being seen. AFP then collected the results of the completed surveys for analysis.

2.1 SURVEY DESIGN

The AFP survey was conducted county-wide and disseminated among all individuals seeking services from the organizations listed above. Our analytic sample focused on men who have sex with men, transwomen, or gender nonconforming individuals who were assigned a sex of male at birth who had taken the survey at the ACHD HIV/STD clinic. This site-specific analysis was due to recruitment methods that differed based on various sites and incentivized survey taking (which did not take place at the ACHD HIV/STD clinic). This decision was also made due to previous research stating that HIV/STI clinics or HIV testing sites have been associated with reaching those who are more at risk for HIV infection and can get information surrounding HIV prevention to them effectively.^{6,9,12,14,15} It was also chosen due to higher rates of HIV seroconversion within MSM who have been infected with STIs or multiple STIs as the HIV/STD clinic is a testing site for STIs and could potentially be an accessible starting point for the initiation of PrEP.^{21,22,23,24,25}

2.1.1 Demographic Measures

This analysis focuses on PrEP awareness, which is the first question on both surveys, and includes seven additional questions listed below in Table 1 with the corresponding number

where they appear in each survey, to provide further insight into the sample population demographics. The age question had categories of “Younger than 18”, “26-35”, “36-45”, “46-55”, and “55+”. Sex assigned at birth was also dichotomous as “Male” or “Female”. Gender options were “Male”, “Female”, “Transgender”, “Do not identify as female, male, or transgender”, or “Other: ___” with a free response blank. Options for sexual orientation were “Bisexual”, “Gay or lesbian”, “Straight/Heterosexual”, “Transgender, transsexual, or gender nonconforming” or “Other: ___” with a free response blank. Categories of race choices were “American Indian/Alaska Native”, “Asian”, “Black or African American”, “Native Hawaiian/Other Pacific Islander”, “White”, “Prefer not to answer”, or “Other: ___” with a free response blank.

2.1.2 Other Predictors

Perceived risk of HIV infection has answer selections of “No (low risk)”, “Maybe (moderate risk)”, “Yes (high risk)”, “Not sure”, or “NA – I’m a person living with HIV”.

2.1.3 Outcome Measure

PrEP awareness was a dichotomous question with responses of either “Yes” or “No”. It is important to note the difference in survey design between the 2016 and 2017 PrEP surveys, specifically the wording of questions and answer choices. With the question assessing perceived risk of contracting HIV question, the 2016 survey did not have an answer option for those who already are HIV-positive, while the 2017 survey provided that option. For this reason, all individuals were self-identified as HIV-positive in 2017 were eliminated from the analysis. In the 2017 survey, the question about age was phrased “What is your age?”, while in the 2016 survey,

the question was asked, “How old are you?”. These were thought to be similar and comparable between the two years. The sexual orientation question in the 2016 survey had an option to choose all that applied to the individual and a transsexual option while the 2017 survey did not offer either of these options. There were no individuals who identified as solely transsexual in the sample and those who checked more than one option for this question in 2016 were placed in an “Identifies as Two of the Choices” category. The race question differed as well in that the 2017 survey gave an “Other” option with a chance to fill in how the individual identified while the 2016 survey did not. “Other” options were either placed into the Mixed/Multiracial category if the individual specified as such in the given blank or the “Other” category if the individual did not specify a Race in the given blank.

Table 1. List of Questions from Original Survey Included in Analysis

Question	Code
Have you ever heard of PrEP (Pre-Exposure Prophylaxis)?	PrEP Awareness
Do you feel you are at risk for contracting HIV?	Perceived Risk of HIV Infection
How old are you?	Age
What sex were you assigned at birth, on your original birth certificate?	Sex
How do you describe yourself?	Gender
Do you think of yourself as:	Sexual Orientation
What category best describes your race?	Race

2.2 ANALYTIC SAMPLE

This study began including surveys taken by all individuals, $n = 2,036$. Initially, eleven individuals were excluded from the analysis as they did not answer the PrEP awareness question

(n=2,036). From there, 369 individuals who did not take the survey at the ACHD HIV/STD clinic were removed (n=1,656). Then, 547 individuals who were assigned a sex of female at birth were removed (n=1,109). It should be noted that individuals with a gender of female were included if their sex at birth was male as well as gender non-conforming individuals who do not identify as male or female. Additionally, 706 individuals who identified as straight cis-gender and male were also removed (n=403). Five individuals were removed due do self-identifying as HIV-positive (n=398). Finally, 207 individuals were removed from the analysis because they did not answer the sex, gender, or sexual orientation questions (n=191). This is because without those identifiers we could not be positive that they fit into our target population. Figure 3 below depicts this process in a flowchart.

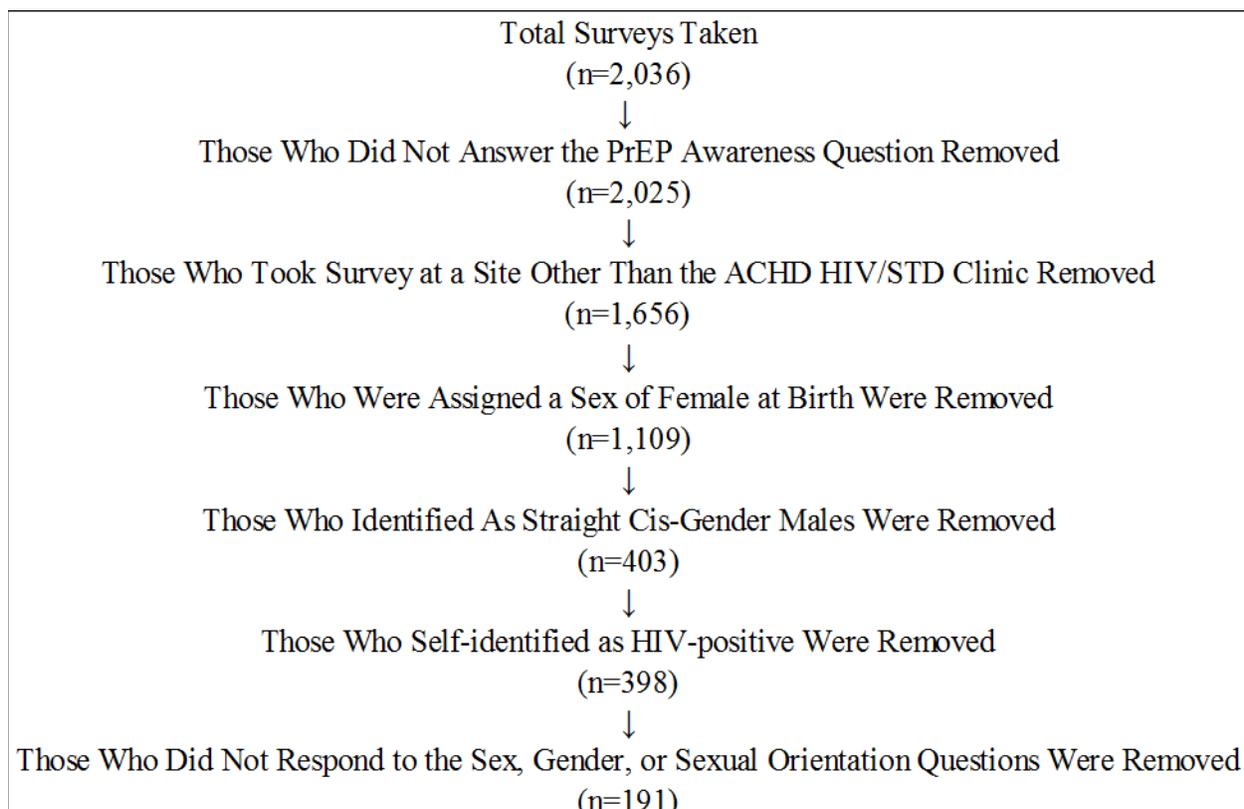


Figure 3: Flowchart of Individuals Included in Analysis

2.3 DATA ANALYSIS

The scope of this study is to assess the level of PrEP awareness in MSM and transgender women who sought services from the ACHD HIV/STD clinic and if awareness of PrEP changes based on different demographics such as age, race, perceived risk of HIV infection, or sexual orientation. These 191 surveys were analyzed. Predictor variables included year, self-reported perceived risk of HIV infections, age, gender, sexual orientation, and race. The outcome variable was lack of PrEP awareness. Initial chi square tests were run to see if these each of these demographic factors were independently significantly associated with PrEP awareness. Then a series of bivariate logistic regressions were performed to demonstrate the likelihood of association (odds ratios) with each predictor on the outcome. Finally, a multivariable analysis was run to compare each individual demographic factor to PrEP awareness controlling for all other factors. This produced adjusted odds ratios (aOR) for the association of each demographic variable on lack of PrEP awareness. These tests were run in order to create a clear picture of what demographics could be associated with PrEP awareness in order to make scientific and research-based suggestions for interventions to increase awareness among those who have lower PrEP awareness. All analyses performed were done using Stata/SE version 15.0 (StataCorp LP, College Station, TX).

3.0 RESULTS

Table 2 summarizes the characteristics of the study population included in this analysis. Of the total population 84% (n=160) had heard of PrEP while 16% (n=31) had not. The table summarizes characteristics based on PrEP aware or not PrEP aware giving number and percent of each as well as a corresponding chi-square value.

Gender was identified to be a significant predictor of PrEP awareness ($p= 0.006$). Of the total population 96.3% self-identified as male (n=184), 1.0% self-identified as female (n=2), 2.1% self-identified as gender non-conforming (n=4), and 0.5% self-identified as a gender other than the choices given on the survey (n=1). Sexual orientation was also identified to be a significant predictor of PrEP awareness. Of the total population 1.6% self-identified as straight/heterosexual, 62.8% self-identified as gay (n=120), 33.5 self-identified as bisexual (n=64), 0.5% self-identified as two or more of the choices given (n=1), and 1.6% self-identified as an option other than the choices given on the survey (n=3).

Year survey was taken, self-reported perceived risk of HIV infection, age, and race were not found to be significant predictors of PrEP awareness. 41.4% of the surveys were taken in 2016 (n=79) and 58.6% of the surveys were taken in 2017 (n=112). Of the total population 37.7 self-reported a low perceived risk of HIV infection (n=72), 44.5% self-reported a moderate perceived risk of HIV infection (n=85), and 12.6% self-reported a high perceived risk for HIV infection. 77.5% of the participants were under the age of 36 (n=148). Of the participants in this

analysis 60.7% identified as White/Caucasian (n=116), 12.6% identified as Black/African American (n=24), and 10.5% identified as Mixed/Multiracial (n=20).

Table 2. Characteristics of MSM Population Broken into PrEP Aware and Not PrEP Aware

		PrEP Awareness Overall (n=191)		PrEP Aware (n=160)	Not PrEP Aware (n=31)	p-value
		Yes (n=160)	84%			
		No (n=31)	16%			
		<i>n / %</i>		<i>n / %</i>	<i>n / %</i>	
Year	2016	79 / 41.4		62 / 78.5	17 / 21.5	0.096
	2017	112 / 58.6		98 / 87.5	14 / 12.5	
Self Reported Perceived Risk of HIV Infection	Low Risk	72 / 37.7		56 / 77.8	16 / 22.2	0.130
	Moderate Risk	85 / 44.5		75 / 88.2	10 / 11.8	
	High Risk	24 / 12.6		22 / 91.7	2 / 8.3	
	Missing in Analysis	10 / 5.2		7 / 70.0	3 / 30.0	
Age	18-25	75 / 39.3		65 / 86.7	10 / 13.3	0.258
	26-35	73 / 38.2		61 / 83.6	12 / 16.4	
	36-45	21 / 11.0		17 / 81.0	4 / 19.0	
	46-55	12 / 6.3		11 / 91.7	1 / 8.3	
	55+	10 / 5.2		6 / 60.0	4 / 40.0	
Gender	Male	184 / 96.3		157 / 85.3	27 / 14.7	0.006*
	Female	2 / 1.0		1 / 50.0	1 / 50.0	
	Gender Non-conforming	4 / 2.1		1 / 25.0	3 / 75.0	
	Other	1 / 0.5		1 / 100.0	-	
Sexual Orientation	Gay	120 / 62.8		106 / 88.3	14 / 11.7	0.007*
	Straight/Heterosexual	3 / 1.6		1 / 33.3	2 / 66.7	
	Bisexual	64 / 33.5		51 / 79.7	13 / 20.3	
	Identifies as Two of the Choices	1 / 0.5		1 / 100.0	-	
Race	Other	3 / 1.6		1 / 33.3	2 / 66.7	0.167
	White/Caucasian	116 / 60.7		103 / 88.8	13 / 11.2	
	Black/African American	24 / 12.6		18 / 75.0	6 / 25.0	
	Native Hawaiian/Pacific Islander	1 / 0.5		1 / 100.0	-	
	Asian	11 / 5.8		9 / 81.8	2 / 18.2	
	Mixed/Multiracial	20 / 10.5		13 / 65.0	7 / 35.0	
	Other	1 / 0.5		1 / 100.0	-	
Missing in Analysis	18 / 9.4		15 / 83.3	3 / 16.7		

*denotes statistical significance at $\alpha = 0.05$

3.1 REGRESSION ANALYSIS

Bivariate and multivariable logistic regressions were used to model the relationship between year survey was taken, self-reported perceived risk of HIV infection, age gender, sexual orientation, race, and awareness surrounding PrEP. The results are shown in Table 3 with odds ratios (OR) and adjusted odds ratios (aOR) and the corresponding 95% confidence intervals.

The year a participant took the survey was taken was not found to be statistically significant with PrEP awareness (aOR = 0.45; 95% CI: 0.16, 1.27). Compared to low self-reported perceived risk of HIV infection all other perceived risks for HIV infection were found not to be statistically significant, moderate risk (aOR = 0.85; 95% CI: 0.30, 2.35) and high risk (aOR = 0.63; 95% CI: 0.12, 3.35). Compared to 18-25-year-old individuals, those 26-35, 36-45, and 46-55 were not found to be statistically significant for PrEP awareness (aOR = 1.74; 95% CI: 0.55, 5.44, aOR = 2.26; CI: 0.52, 9.88, aOR = 1.42; 95% CI: 0.13, 15.35 respectively). However, compared to 18-25-year-old individuals, those 55+ were significantly less likely to be aware of PrEP (aOR = 6.32; 95% CI: 1.13, 35.21). Compared to a gender of male, gender non-conforming individuals were less likely to be aware of PrEP in a bivariate analysis (OR = 17.44; 95% CI: 1.75, 173.95), however in the multivariable analysis this value was non-estimable because the sample size was too small. Compared to a gender of male, females were not found to be statistically significant for PrEP awareness (aOR = 7.73; 95% CI: 0.18, 317.26). Other genders were non-estimable because of a sample size that was too small. Compared to those who self-identified as gay, those who self-identified as Straight/Heterosexual were more likely to be PrEP aware in a bivariate analysis (OR = 15.15; 95% CI: 1.28, 178.00). However, in the

multivariable analysis this result was non-estimable and bisexuality was not found to be statistically significant (aOR = 1.78; 95% CI: 0.67, 4.73). All other sexual orientations were non-estimable because the sample size was too small. Compared to White/Caucasians, Mixed/Multiracial individuals were significantly more likely to be aware of PrEP in both the bivariate (OR = 4.27; 95% CI: 1.44, 12.62), but not in the multivariable analysis (aOR = 3.79; 95% CI: 0.88, 16.36). Compared to White/Caucasians, Black/African Americans and Asians were not statistically significant for PrEP awareness (aOR = 2.81; 95% CI 0.69, 11.49, aOR = 3.75; 95% CI 0.62, 22.69 respectively).

Table 3. Logistic Regression – Two-category PrEP Awareness

Variable	PrEP Awareness OR (95% CI)	PrEP Awareness aOR (95% CI)
Year		
2016	REF	REF
2017	0.52 (0.24, 1.13)	0.45 (0.16, 1.27)
Self-reported Perceived Risk of HIV Infection		
Low	REF	REF
Moderate	0.47 (0.20, 1.11)	0.85 (0.30, 2.35)
High	0.32 (0.07, 1.50)	0.63 (0.12, 3.35)
Missing in Analysis	1.50 (0.35, 6.47)	0.80 (0.09, 6.77)
Age		
18-25	REF	REF
26-35	1.28 (0.52, 3.17)	1.74 (0.55, 5.44)
36-45	1.53 (0.43, 5.48)	2.26 (0.52, 9.88)
46-55	0.59 (0.07, 5.09)	1.42 (0.13, 15.35)
55+	4.33 (1.04, 18.10)	6.32 (1.13, 35.21)
Gender		
Male	REF	REF
Female	5.81 (0.35, 95.79)	7.73 (0.18, 317.26)
Gender Non-conforming	17.44 (1.75, 173.95)	Non-estimable
Other	Non-estimable	Non-estimable
Sexual Orientation		
Gay	REF	REF
Straight/Heterosexual	15.14 (1.28, 178.00)	Non-estimable
Bisexual	1.93 (0.85, 4.41)	1.78 (0.67, 4.73)
Identifies as Two of the Choices	Non-estimable	Non-estimable
Other	15.14 (1.28, 178.00)	Non-estimable
Race		
White/Caucasians	REF	REF
Black/African American	2.64 (0.89, 7.85)	2.81 (0.69, 11.49)
Native Hawaiian/Pacific Islander	Non-estimable	Non-estimable
Asian	1.76 (0.34, 9.05)	3.75 (0.62, 22.69)
Mixed/Multiracial	4.27 (1.44, 12.62)	3.79 (0.88, 16.36)
Other	Non-estimable	Non-estimable
Missing in Analysis	1.58 (0.40, 6.22)	1.32 (0.29, 6.05)

(n=191) OR = odds ratio; 95% CI = 95% confidence interval. All OR are a bivariate logistic regression
aOR = adjusted odds ratio; 95% CI = 95% confidence interval. All aOR are a multivariable logistic regression
controlling for all other demographic variables in the table. REF refers to the reference category of which
other categories were compared to. Non-estimable refers to categories that had too few individuals in the
category.

4.0 DISCUSSION

This study contributed to the limited literature on PrEP awareness, how it can change in different subpopulations, as well as the increase of average awareness within this population. These results highlight that the MSM, transgender women, and gender non-conforming individuals in Allegheny County who sought services at the ACHD HIV/STD clinic have a high awareness of PrEP. More importantly, with 84% of the individuals being aware of PrEP, this shows a large increase in awareness from past studies of MSM populations.^{8,9,10,11,12,13,14}

Compared to 18-25-year-old individuals, those 55+ were significantly less likely to be aware of PrEP (aOR = 6.32; 95% CI: 1.13, 35.21). This is different from previous research as other studies have found increase in PrEP awareness with older age.⁹ This study found that those 55 years of age or older were less likely to be aware of PrEP. This could be attributed to targeted intervention towards younger ages because of previous research that had stated these individuals were at a higher risk of contracting HIV than their older counterparts. However, older populations should not be neglected. Interventions should be targeted towards all age groups within the MSM population.

Compared to White/Caucasians, Mixed/Multiracial individuals were significantly less likely to be aware of PrEP in the bivariate analysis (OR = 4.27; 95% CI: 1.44, 12.62). Compared to a those who identify as gay, straight/heterosexual individuals and those who denoted a sexuality of other were significantly less likely to be aware of PrEP in the bivariate analysis (OR

= 15.14; 95% CI: 1.28, 178.00, OR = 15.14; 95% CI: 1.28, 178.00 respectively). Compared to those who identify as male, those who identified as gender non-conforming were significantly less likely to be aware of PrEP in the bivariate analysis (OR = 17.44; 95% CI: 1.75, 173.95). However, in all the cases listed above there was no statistical significance when controlling for all factors in the equation (year survey was taken, self-reported perceived risk of HIV infection, age, gender, sexual orientation, and race). Gender non-conforming individuals, those who identified as straight/heterosexual, and those who identified as an Other sexual orientation were non-estimable in the multivariable analysis. This means there were too few individuals in these categories to be able to predict an odds ratio value. Future research needs to focus on recruiting individuals in minority genders, including transgender individuals, and minority sexual orientations to be able to accurately report if there are any disparities within those populations.

Overall, this study showed a very high level of PrEP awareness was seen in this MSM population from surveys taken at the ACHD HIV/STD Clinic. This is consistent with past findings that HIV testing and their association with higher PrEP awareness. Those seeking care surrounding topics of sexual health would present themselves to providers and health care professionals who could inform them about PrEP. This opens the conversation and allows for PrEP initiation to start which in turn would make them aware of PrEP. This is especially important given that STIs are associated with higher rates of HIV seroconversion. Starting the conversation while having an individual in the office seeking care is a great first stepping stone towards starting someone on a path that can greatly benefit their future. Being PrEP aware is just the first step. A high portion of those seeking services from this specific HIV/STD clinic show promising results for starting this process. More research should be done here to see if these individuals are having deeper conversations with the medical professionals in this clinic about

PrEP, taking PrEP, and other questions they might have to ensure the best care is being given at this site.

While PrEP awareness was defined in this study as being aware the PrEP is a drug used as a prevention method to protect from HIV infection, PrEP knowledge goes a little deeper in knowing how effective the drug is, how and when to take the drug, what other prevention methods should be used while on the drug, and other functional knowledge surrounding PrEP. With that said, even less is known about functioning knowledge of PrEP within real world application. Kahle et. al. conducted a survey in 2018 to assess the functional knowledge of male US residents that were 18 years of age or older and have has sex with a male in the past six months prior to the survey. This survey asked questions involving efficacy if PrEP is taken as directed, PrEP efficacy if inconsistent use, recommendations of condom use and other sexual health prevention methods while on PrEP, and PrEP effectiveness at reducing other sexually transmitted diseases. About 37% of the participants answered all four questions correctly and most knew the CDC recommendations, however translation to daily lives in the real world is not as certain. In this study only 2% of the participants were using PrEP but increased functional knowledge of PrEP was associated with increased willingness to use PrEP. Therefore, the study concluded that simple awareness may not be enough to get the uptake of PrEP rolling. There may need to be more interventions using functional knowledge of PrEP and how to integrate it into daily life.¹⁸

As PrEP knowledge is at low levels, it is not surprising to see even lower levels of PrEP use within the studies presented above. Krakower et. al., (2012) looked at PrEP use in their survey. Before the iPrEx trial study was released 0.7% of participants reported using PrEP. After the iPrEx trial study was released this increased to 0.9%. Eaton et. al., (2017) reported 4.6% of

the BMSM and transgender women in their study were currently taking PrEP. Khanna et. al., (2017) and Gupta et. al., (2017) also reported very low PrEP usage at 3.7-6.0% and 2% respectively. These rates are alarming as new HIV cases are emerging every year. PrEP would be able to help control another outbreak from happening if it is used effectively.

Based on this study and studies in the past future research needs to be done and interventions need to be implemented around PrEP knowledge and use. As this study found awareness of PrEP seems to be reaching high levels with the MSM community, however those who are not seeking services at sexual health clinics may have lower levels of awareness. The next step reaching out and surveying a broader more diverse sample to get a more accurate picture of MSM PrEP awareness in Allegheny County. Also, further research on PrEP barriers and facilitators, individuals' knowledge how effective PrEP can be at preventing HIV infections, and PrEP uptake needs to be done. For the time being continuing to initiate PrEP uptake and disseminating PrEP awareness and knowledge into at-risk communities is recommended.

4.1 LIMITATIONS

This study was not without its limitations. Given that the bulk of the surveys were from the ACHD HIV/STD clinic this limits the study population. It only takes into account those who were already sought out sexual health related care which could have skewed the results towards a higher level of awareness than the overall MSM population in Allegheny County. This study also assumed that each survey was completed by different individuals and no duplicates were in the sample. Assuming there were no duplicates means that each survey contained new data from a new individual which could skew the results either way. The small sample size (n=191) also

limited the translation to the broader population. This study did not control for factors such as income, education level, and health insurance which may also play a role in PrEP awareness and could either increase PrEP awareness levels in this population or decrease PrEP awareness. Self-reporting bias exists as this survey was asking individuals about sensitive topics on the survey that some were taking in public spaces. This may have skewed the results in that individuals may not have accurately reported their awareness, their self-perceived risk of HIV infection, and their sexual orientation. They also might have had a restricted amount of time to take the survey if they were waiting to be seen by a provider and their wait time was shorter than others resulting in incomplete surveys. Therefore, these surveys could not be included in this analysis. There was also not a question on the survey they asked why the individual was seeking services from the clinic. These individuals might not have been at the clinic for STIs, or HIV testing which would be interesting to know why they were at the clinic and may contribute to further insight into PrEP research.

5.0 CONCLUSION

As research advances with discoveries of new information and prevention methods for HIV infections it is important that the public stay up to date as well. The bridge between science and the general population has grown over the years leaving some populations in the dark. Public health has a responsibility to bridge this gap. PrEP awareness is a great example of how interventions were and can continue to be used to increase PrEP awareness in the community, especially in at-risk populations such as MSM and specifically BMSM. Seeing a large increase in awareness in this study show promise but there is still progress to be made.

This research suggests that this high-risk population for HIV infection have a high level of awareness in regards to PrEP. However, more research should be done to further investigate gender and sexual minorities within the LGBT community, barriers and facilitators of PrEP awareness and uptake, especially in the MSM population. Additionally, research should be done to assess PrEP adherence and long-term continuation of PrEP use within this population to assist in the creation and implementation of interventions specifically catered towards MSM. More research should also be done on how HIV/STD clinics can be used as a facilitator of PrEP conversations the go beyond just basic awareness of PrEP.

HIV is not an infectious disease that has disappeared from society. While deaths and new infections have dramatically decreased with new pharmaceutical advances, such as ART and PrEP/Truvada, new infections are happening every day. By using the resources made available

by research, such as PrEP, these infections can be dramatically reduced. The need for PrEP awareness is a crucial piece of the puzzle to stopping a re-emergence of an HIV epidemic. For PrEP to work individuals need to be made aware of its existence. Once populations are aware then uptake of PrEP can begin on a larger scale and more research conducted to analyze the factors that are inhibiting and facilitating its use.

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