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Awareness, Willingness, and Use of Pre-Exposure Prophylaxis (PrEP) Among
Hispanic/Latino Men Who Have Sex with Men, The American Men's Internet Survey 2013-
2014.

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Master of Public Health

Global Epidemiology

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Bachelor of Arts
Santa Clara University
2010

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An abstract of
A thesis submitted to the Faculty of the
Rollins School of Public Health of Emory University
in partial fulfillment of the requirements for the degree of
Master of Public Health
in Global Epidemiology
2016

Abstract

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By Kelly Fletcher

Pre-exposure prophylaxis (PrEP) is a promising biomedical prevention method aimed at reducing human immunodeficiency virus (HIV) incidence for high risk populations like Hispanic/Latino men who have sex with men (MSM) in the United States. In order to increase uptake of PrEP, a robust understanding of the characteristics of Hispanic/Latino MSM and their awareness of, willingness to use, and use of PrEP is warranted. An annual, cross-sectional survey of MSM was conducted online in 2013 and 2014. Multivariate logistic regression models selected using a backwards elimination procedure were used to assess the characteristics of 1,446 Hispanic/Latino, HIV-negative MSM in relation to their awareness of, willingness to use, and use of PrEP. Awareness, willingness, and use increased with study year. Sexual health and HIV risk behavior including diagnosis of a bacterial STI in the last 12 months and number of sex partners were associated with awareness, willingness, and use of PrEP while sociodemographic characteristics including insurance type and education level were associated with awareness. Although 55.1% of participants were aware of PrEP and 78.5% reported willingness to take PrEP, only 5.5% reported usage. Increasing access to HIV and sexual health services, enhancing health care provider knowledge of PrEP, and encouraging serodiscussion may help facilitate increased uptake to PrEP among Hispanic/Latino MSM.

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Acknowledgements

I would like to extend my sincere thanks to Dr. Travis Sanchez, my faculty thesis advisor, for his time, patience, and mentorship, and the staff at PRISM Health for their technical and analytical support. For my parents, Mary Kay and Jim, and my siblings, Erin and Colin, in their unwavering support throughout my MPH program.

This study would not be possible without the generous contribution to the American Men's Internet Survey from the MAC AIDS Fund and The National Institutes of Health [P30AI050409] – The Emory Center for AIDS Research.

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INTRODUCTION

It is estimated that 25% of men who have sex with men (MSM) may meet the Centers for Disease Control and Prevention (CDC) criteria for substantial risk of human immunodeficiency virus (HIV) infection and are therefore indicated for pre-exposure prophylaxis (PrEP) -- a once daily antiretroviral taken by HIV-negative individuals to reduce HIV risk (1). When used correctly, PrEP is highly effective with HIV risk reductions of up to 92% among MSM (2). Significant coverage and adherence to PrEP is required in order to decrease the estimated 30,000 incident HIV infections occurring among MSM annually (1). One impact model study suggested that 50% coverage of high risk MSM in conjunction with moderate adherence could reduce incident infection by 29% over 20 years (2).

The PrEP continuum of care suggests that to achieve population level protection through adherent PrEP use, high risk individuals must first be aware of and willing to use PrEP in addition to having access to a health care provider who is also aware and willing to prescribe PrEP (3). There is a growing body of literature indicating some awareness of and willingness to use PrEP among MSM (4-10). Other studies found barriers in access and social stigma (11) associated with low willingness and use among HIV serodiscordant couples (12) and racial minority MSM (13). Furthermore, very few studies have considered how awareness and willingness to use PrEP translate into actual PrEP use among high risk MSM (14).

Studies have generally looked at PrEP acceptability among the general MSM population which may ignore important cultural, social, and behavioral differences in attitudes of HIV prevention methods. One study found that after learning about PrEP, Hispanic/Latino MSM were more likely to select condoms only as their preferred method of HIV prevention

over a combination of PrEP and condoms (15). There may be further demographic differences such as urbanicity, access to care, income, age or behavioral characteristics like number of male sex partners, online partner seeking behavior, and engaging in receptive anal intercourse without condoms that may correlate with awareness, willingness, and use of PrEP within racial/ethnic groups. Assessing these characteristics in association with awareness, willingness, and use of PrEP is of particular importance among Hispanic/Latino MSM given their disproportionate burden of HIV (16), prevalence of late HIV testing (17), and decreased access to healthcare in the United States (18). Moreover, Hispanic/Latino MSM account for 79% of all new HIV infections among Hispanic/Latinos in the US (19). Understanding these characteristics provides valuable information to facilitate the PrEP continuum of care by tailoring health education campaigns, promoting discussion with health care providers, and increasing access to cost sharing programs.

There are no published studies that specifically looked at characteristics of Hispanic/Latino MSM in relation to awareness of, willingness to use, and use of PrEP. This study sought to identify the correlates of awareness, willingness, and use of PrEP among Hispanic/Latino MSM residing in the United States using an online survey platform and model the most important covariates across all three outcomes. It was hypothesized that awareness, willingness, and use would be low but increase with survey year. Additionally, it was hypothesized that method of online recruitment, income, health insurance, CDC Risk Score, and CDC PrEP indication would be associated with increased awareness, willingness, and use.

METHODS

American Men's Internet Survey

The American Men's Internet Survey (AMIS) is a cross-sectional behavioral survey administered annually online to English-speaking MSM who reside in the United States. The AMIS methods have been previously described in detail but are summarized here (20). Using convenience sampling, MSM were recruited through email blasts and online advertisements featuring male models of various races and ethnicities on gay social networking sites, general social networking sites, general gay interest websites, and geospatial networking applications. This analysis used surveys collected in two cycles between December 2013 and May 2014 (AMIS-2013), and between December 2014 and May 2015 (AMIS-2014). The survey included an informed consent page and consent question followed by a set of questions to determine eligibility. Eligibility was defined as either 18 years of age or older (AMIS-2013) or 15 years of age or older (AMIS-2014), male sex at birth, male gender identity, and ever reporting anal or oral sex with a man. Men who satisfied the eligibility criteria proceeded to a core questionnaire of demographics, sexual behaviors, HIV testing, history of accessing HIV prevention services, and drug/alcohol use that was administered to all AMIS study eligible participants. In AMIS-2013, a subset of survey participants was randomized to receive an additional set of questions related to knowledge, willingness, and current use of PrEP. In AMIS-2014, all participants received these questions. No personal identifiers were collected except for IP address which was used to validate residency in the United States and identify duplicate entries. There was no incentive provided to participate. The study was approved by the Emory University Institutional Review Board (IRB). Data are all collected and stored on secure servers and are protected under a federal certificate of confidentiality.

For the purpose of this analysis, we only included complete, unduplicated surveys of men who self-identified as Hispanic/Latino, who reported sexual contact with a man in the past 12 months, and who received the set of PrEP questions. Men who reported that they were HIV positive were not asked the PrEP questions. Participants without a valid recruitment source were further excluded from the analysis because the validity of the surveys could not be determined.

PrEP Awareness, Willingness, and Use

Awareness, willingness, and use of PrEP were assessed using the questions in Appendix 1. In AMIS-2014, two sets of PrEP questions were administered with half of the sample randomized to each set. Despite slight differences in question wording between AMIS-2013 and AMIS-2014, the dependent variables were combined across both years after finding strong correlations across the variables. All questions were assessed using a yes/no/refused/don't know response. Individuals who responded "Don't Know" or "Prefer not to answer" to awareness questions were combined with those who responded "No". Those who responded "Don't Know" or "Prefer not to answer" to willingness questions were combined with those who answered "Yes" because they may not yet have definitive attitudes against PrEP use and may therefore be willing. Furthermore, willingness to use PrEP was not asked of participants who reported current usage. These respondents were recoded as "Yes" instead of missing because their current use indicates willingness. Responses of "Don't know" or "Prefer not to answer" for use questions were combined with "No" because in order to obtain the most conservative estimates of use, we assumed that those who were not sure about their use or refused to answer were likely not using PrEP.

Independent Variables

Demographics

Participants were asked to report demographic characteristics including age, education (less than high school diploma, high school diploma or equivalent, some college or technical degree, college degree or postgraduate education), insurance status (None, Private, Public, Multiple, Refused), and annual household income (\$0-\$19999, \$20000-\$39999, \$40000 – \$74999, \$75000 or more, Prefer not to answer). Urbanicity (Rural/Urban) and US Census-based region (New England, Middle Atlantic, East North Central, West North Central, South Atlantic, East South Central, West South Central, Mountain, Pacific, U.S. Territories) were calculated using a combination of county and ZIP code of current residence (20). For analysis, age was categorized (15-24, 25-29, 30-39, 40+ years of age), census division was collapsed into larger census regions (Northeast, Midwest, South, and West), and the two lowest education categories (high school or equivalent and less than high school) were collapsed to allow for adequate sample sizes in each category across PrEP use. Due to high proportion of missing responses to annual household income, a fifth category, “Refused”, was created.

Sexual Health and HIV Risk Behaviors

Participants reported sexual behaviors including number of male sex partners, diagnosis of bacterial sexually transmitted infection (STI) in past 12 months (Yes/No), HIV test in past 12 months (Yes/No), HIV serodiscordant partner (Yes/No), unprotected anal intercourse (Yes/No), receptive anal intercourse without a condom with last sex partner (Yes/No), insertive anal intercourse without a condom with last sex partner (Yes/No), injection drug use in past 12 months (Yes/No), and crystal methamphetamine or speed use (Yes/No) as

possible correlates of PrEP awareness, willingness, and use. Recruitment source (gay social networking, general gay interest, general social networking, geospatial networking) was tracked through the online survey platform (20). CDC risk score (<10 , ≥ 10) was calculated as a composite variable using 12 month time intervals of variables comparable to the CDC calculator (21); sexual contact with a man, number of male sex partners (1, 2-5, 6-10, 10+), receptive anal intercourse without a condom (last sex), HIV positive partner, insertive anal intercourse without a condom (last sex), and crystal methamphetamine/speed use. PrEP indicated (Yes/No) was calculated using variables similar to CDC guidelines (21); adult HIV negative man reporting any male sex partner, not engaging in a monogamous partnership, and reporting any sex without condoms, bacterial STI diagnosis in last 12 months, or having an HIV-positive male partner (ongoing or last sex). The CDC timeframe is 6 months whereas our variables used a 12 month time interval.

Analysis

Univariate analyses were performed to describe the characteristics of participants who satisfied the inclusion criteria for each yearly cycle and the proportions of eligible participants with awareness of, willingness to use, and use of PrEP. Chi square tests were performed for bivariate logistic associations between each of the independent variables and each of the three outcome variables (aware of PrEP, willing to use PrEP, and use of PrEP). Each of the variables significant in the bivariate analysis ($p < .05$) were then entered into a model selection procedure to identify a parsimonious model that best fit the data while controlling for relevant confounders in relation to each of the three dependent variables. Three models (aware of PrEP, willing to use PrEP, and use of PrEP) were constructed using a backwards elimination procedure for multivariable model selection. The selection method

used a significance level threshold of $p < .05$ to keep variables in the model as a more conservative approach. Hosmer-Lemeshow goodness of fit tests were run for each of the three models to assess how well the selected models fit the sample data. Variables that remained significant following a backwards elimination were entered into final logistic regression models that used the predicted margins approach to estimate prevalence ratios and 95% confidence intervals for PrEP awareness, willingness, and use. Analyses were conducted using SAS version 9.4 (SAS Institute, Cary, NC) and Sudaan version 11.01.1 (RTI International, Research Triangle Park, NC).

RESULTS

Demographics

Of the 2,392 Hispanic/Latino respondents who had sex with a man in the past 12 months and had a valid recruitment source, 334 reported being HIV positive and 612 did not receive the PrEP questions and were excluded from the analysis resulting in a sample of 1,446 Hispanic/Latino MSM (Table 1). These participants represented all age groups with a slightly higher proportion of men 40+ years of age. Most reported insurance coverage through a private or public carrier while 13.2% were uninsured. The majority reported a college degree or postgraduate education with approximately one-fourth of respondents in each annual household income category. Two-thirds resided in urban areas and most lived in the Pacific and South regions of the United States. Over half of participants were recruited from general social networking sites while approximately a third was recruited from geospatial networking sites.

Sexual Health and HIV Risk behaviors

In terms of sexual health and HIV risk behaviors, over half reported an HIV test in the past 12 months and the majority did not report a bacterial STI diagnosis in the past 12 months (Table 1). Approximately 30% of participants reported 2 to 5 sex partners in the past 12 months followed by 21.2% reporting over 10 partners. One-fourth had a known HIV-positive male sex partner in the past 12 months. Over two-thirds reported having anal intercourse without a condom with a male partner in the past 12 months and a quarter had receptive anal intercourse without a condom during their last sexual encounter with a male partner. Per the current CDC clinical practice guidelines for PrEP, just over half met the CDC indication criteria for PrEP use and just under half were at heightened risk (≥ 10 risk score).

PrEP Awareness

Overall, 55% (786/1426) of participants reported prior awareness of PrEP with awareness significantly greater among participants from AMIS-2014 (compared to AMIS-2013) and those 40+ years of age (compared to those 15-24 years); (Table 2). Socioeconomic status was associated with increased awareness; those on public insurance were less likely to be aware of PrEP (compared to private insurance) and awareness increased with education level. Men from geospatial networking sites more likely to be aware of PrEP (compared to general social networking sites). Men who recently accessed sexual health services were more likely to be aware of PrEP with higher awareness among those who had an HIV test in the last 12 months and those with a recent bacterial STI diagnosis. Awareness increased with number of sexual partners; those reporting ≥ 10 partners were 32% more likely to be aware of PrEP

compared with those with one partner. Men classified as lower risk by the CDC risk calculator were less likely to be aware of PrEP (compared with heightened risk).

PrEP Willingness

Overall, 78.5% (862/1098) of participants indicated willingness to take PrEP (Table 3). Sexual health and HIV risk behaviors were the only groups of variables significantly associated with willingness to use PrEP in the multivariable model. Those who had a bacterial STI diagnosis in last 12 months and those in serodiscordant partnerships were more likely to be willing to take PrEP. Men with 6-10 sex partners had the highest prevalence ratio of willingness (compared to one partner). Men who had engaged in condomless receptive anal intercourse during their last sexual encounter were less likely to be willing to take PrEP (compared to those who did not engage in receptive sex or used a condom during receptive sex). It was postulated that men engaging in receptive anal intercourse without a condom would be more likely to be willing to use PrEP after controlling for other covariates. As such, a three level variable was created to differentiate willingness between men engaging in receptive anal sex with condoms, without condoms, and those not engaging in receptive sex. Those who did not use condoms during receptive anal sex were less likely to be willing to use PrEP (compared to who used condoms during receptive sex); (aPR 0.87, 95%CI 0.80-0.95). The association between willingness to use PrEP was not significant for men who did not engage in receptive sex (compared to those who used condoms during receptive sex); (aPR 0.93, 95%CI 0.87-1.00).

PrEP Use

Overall, 5.5% (20/906) of participants reported use of PrEP in the last 12 months with participants from AMIS-2014 significantly more likely to use PrEP than participants from AMIS-2013 (Table 4). In terms of sexual health and HIV risk factors, participants who had an HIV test in the last 12 months, those with a bacterial STI diagnosis in last 12 months, and those in serodiscordant partnerships more likely to have used PrEP. The majority of PrEP users reported high numbers of male sexual partners with two thirds of current users reporting 10 or more sex partners in the last 12 months.

DISCUSSION

Prevalence of Awareness, Willingness, and Use

Other researchers have noted that high PrEP coverage rates and moderate adherence are necessary to achieve a population level decrease in HIV risk among MSM (2, 3) but we found that the majority of our Hispanic/Latino study participants who may be good candidates (per the CDC guidelines) were not taking PrEP. Awareness was also low in this group with approximately half of participants reporting previous knowledge of PrEP; though this increased from AMIS-2013 to AMIS-2014. The majority of participants were willing to take PrEP which also increased by study year. These findings may indicate a deficiency in community knowledge but high and increasing interest in biomedical prevention methods. Awareness, willingness, and use of PrEP over our study timeframes should increase because PrEP received FDA approval in 2012 and CDC clinical practice guidelines were released in 2014, but these measures were not as high as expected given our sample of internet-using, educated men who mainly reside in urban US areas as found in a study of internet-using individuals in New York City (22). This might suggest additional

barriers in facilitating the PrEP continuum of care that are independent of traditional socioeconomic barriers to care such as deficits in provider knowledge (23), social stigma(24), concerns about side effects (12, 22) and how PrEP may interact with alcohol consumption and drug use (25).

Demographics

Health insurance was not significantly associated with willingness and use, but those with public insurance were significantly less likely to be aware of PrEP (compared with private insurance). This finding was not entirely explained by other socioeconomic factors suggesting that those who serve public payer patients may be less likely to promote PrEP awareness or may indicate additional barriers for these patients to accessing regular care (and therefore PrEP information) despite health insurance coverage. One study of internet using groups found significant associations for age and education across PrEP use and awareness in the general population (14) whereas our study found this association in awareness but not in willingness and use. This may suggest that individual behaviors and provider perceptions may be more important covariates rather than demographic and socioeconomic factors in facilitating subsequent steps of the PrEP continuum of care for Hispanic/Latino MSM.

Sexual Health and HIV Risk Behaviors

Consistent with previous findings of PrEP awareness and use among MSM (14, 26), men in our study who had an HIV test or received a bacterial STI diagnosis in the last 12 months were significantly more likely to be aware of, willing to use, and use PrEP. We expect high associations with HIV and STI diagnosis and use as HIV/STI tests are biomarkers for starting and continuing use of PrEP. These men may have greater access to sexual health

services for including testing, counseling, and treatment along with providers who may be more knowledgeable about PrEP (23). This might suggest that basic access to health insurance is not sufficient to increase PrEP uptake but rather the type of provider may increase willingness and use. One study found that health care providers who routinely provide sexual health and HIV prevention services were more likely to be aware of and prescribe PrEP (23). Men who access these services may also be more willing to disclose their sexual orientation and preferences to providers (14, 18) who are more likely to prescribe PrEP to high risk MSM over other groups (27). There is a need and an interest to increase provider knowledge about PrEP (23) through dissemination of the CDC clinical practice guidelines and continuing education seminars and trainings.

Our study did not find that having an HIV serodiscordant partner was associated with awareness and willingness, but was associated with PrEP use. Higher use of PrEP among MSM in serodiscordant partnerships underscores that these men are indeed a PrEP aware and PrEP willing group. Other variables such as socioeconomic status and access to sexual health and HIV testing services may be more important covariates to raise awareness and garner willingness while knowing a partner's HIV positive status may be more impactful for translating willingness into action in PrEP use. This reinforces the need to encourage HIV status disclosure to sex partners, both negative and positive (28), and facilitate discussions about HIV prevention methods among those engaging in serodiscordant partnerships (24). Couples testing and HIV prevention counseling (29) may increase these types of communication.

MSM in our study who engaged in receptive anal sex without a condom during their last sexual encounter were significantly less likely than those who used condoms during receptive sex and those who did not engage in receptive sex to be willing to use PrEP. Given that this group of men is at heightened risk of HIV transmission we might expect that they would have higher willingness to use biomedical HIV prevention methods. When exploring this covariate as a three level variable (receptive sex with a condom, receptive sex without a condom, and no receptive sex), we found that those who used condoms during receptive sex had higher willingness relative to the other two groups. This might suggest that those who already take steps to reduce HIV risk by not engaging in receptive sex or those who use condoms during receptive sex may be more willing to use additional protective measures like PrEP. This differs from findings of a European study that found MSM with safer sex practices such as consistent condom use did not perceive an increased benefit to PrEP (30). This might suggest that Hispanic/Latino men who already adopt safe sex practices may have heightened risk perceptions and are therefore more open to additional protective methods like PrEP. Increased community- and individual-level education tailored to the protective effect of PrEP in tandem with condom use may facilitate increases in willingness and subsequent usage among Hispanic/Latino MSM who already practice safer sex.

Our findings are consistent with studies of internet-using MSM that have also reported low awareness and use (14) but high interest in PrEP (10) that is increasing over time. A study by Mayer et al. also found that socioeconomic variables were associated with increased PrEP awareness, but found higher awareness in younger MSM (14). Our sample found that men ages 15-24 were less likely to be aware of PrEP (compared with men 40+ years) which may indicate important age differences in Hispanic/Latino men's exposure to health information

and health literacy relative to the general MSM population. Mayer et. al also indicated that while socioeconomic indicators were important covariates for awareness, sexual health and HIV risk behaviors were more important covariates for PrEP use. This was consistent with our findings and may suggest that health care provider type and access to sexual health services may be important covariates for increased willingness and use. This similarity in factors may also mean that English-speaking Hispanic/Latino MSM are more similar with the general MSM population, though this should not negate the need for culturally and linguistically appropriate health messages. Mayer et. al did not assess willingness and therefore we cannot make meaningful comparisons for this outcome but there may be important cultural and social differences in how awareness translates to willingness and subsequent use. This association may also not hold true for Spanish monolingual Hispanic/Latino MSM. Other studies have also indicated high willingness to use PrEP (25) among MSM populations, especially when it is offered at no-cost (10). A qualitative study of serodiscordant Latino male couples indicated high interest in PrEP with detailed PrEP education (24). These findings reinforce the need for comprehensive provider education on PrEP clinical guidelines across all provider types, increased community awareness for cost-sharing programs, partner involvement in serodiscussion and prevention options, and improved access to sexual and primary health care.

Strengths

This study contributes to the overall body of literature that is severely lacking in knowledge of Hispanic/Latino MSM behaviors and attitudes regarding PrEP as there are no published studies that have looked specifically at this subset of high risk MSM and with a large sample size. The use of an existing dataset from an annual survey provides a unique opportunity to

conduct a cost effective analysis that can be reassessed longitudinally using a consistent protocol. Traditional studies of HIV risk and prevention attitudes have also focused on MSM surveys conducted in-person at venues such as clubs and universities (20) where social desirability bias may influence estimates of HIV risk and behaviors in this population. Additionally, Hispanic/Latino MSM often bear a greater burden of social isolation as a result of discrimination on both ethnicity and sexuality (31), and may be less likely to frequent these venues or participate in research. The online platform of AMIS thereby provides a unique opportunity to reach more socially isolated populations at high risk for HIV by protecting privacy and reducing these biases. Finally, this study sheds light on an important, growing demographic in the United States and further underscores the need for appropriate public health approaches to address their needs.

Limitations

The overall prevalence of PrEP usage was low which may result in less stable models and estimates. Future studies should revisit these study objectives with larger samples of Hispanic/Latino MSM who are using PrEP. AMIS-2013 and AMIS-2014 were not available in Spanish and therefore the results of this study are not generalizable to monolingual Spanish-speaking Hispanic/Latino MSM. A Spanish language survey was implemented in the AMIS-2015 cycle and will be available for subsequent analyses. Future cycles of the AMIS study should also facilitate targeted bilingual recruitment for Hispanic/Latino MSM to participate. Additionally, the sample is restricted to those with internet access and therefore may not be representative of Hispanic/Latino MSM who do not regularly use the internet such as those of lower socioeconomic status and residents of rural communities.

Conclusions

Hispanic/Latinos represent one of the fastest growing minority groups in the United States. This translates into an increased demand for culturally sensitive and linguistically appropriate health services. Yet, existing approaches to address the HIV prevention needs of Hispanic/Latino MSM are inadequate and noted in the growing and disproportionate burden of HIV in this population. PrEP is one prevention modality that may help address this growing health disparity but further research is needed to develop a robust understanding of the characteristics of Hispanic/Latino MSM and their awareness of, willingness to use, and current use of PrEP as part of a set of prevention methods. This will yield more appropriate campaigns to increase awareness, facilitate health care provider discussion, and uptake of PrEP.

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Table 1. Characteristics of 1,446 HIV Negative Hispanic/Latino MSM Participants, The American Men's Internet Survey (AMIS), 2013-2014

	2013 (n=310)		2014 (n=1,136)		Total (N=1,446)	
	n	%	n	%	n	%
Age						
15-24	103	33.2	279	24.6	382	26.4
25-29	63	20.3	223	19.6	286	19.8
30-39	57	18.4	301	26.5	358	24.8
40 +	87	28.1	333	29.3	420	29.0
Education						
High School Diploma, Equivalent, or Less	43	13.9	156	13.7	199	13.8
Some College or Technical Degree	92	29.7	386	34.0	478	33.1
College Degree or Postgraduate Education	173	55.8	578	50.9	751	51.9
Missing	2	0.7	16	1.4	18	1.2
Insurance Status						
None	59	19.0	132	11.6	191	13.2
Private Only	182	58.7	678	59.7	860	59.5
Public Only	22	7.1	126	11.1	148	10.2
Other/Multiple	27	8.7	88	7.8	115	8.0
Refused	20	6.5	112	9.9	132	9.1
Geographic Distribution						
Northeast	47	15.9	168	14.8	215	15.0
Midwest	32	10.8	118	10.4	150	10.5
South	118	39.9	391	34.4	509	35.5
West	99	33.5	459	40.4	558	39.0
Population Density						
Rural	102	32.9	241	21.2	343	23.7
Urban	208	67.1	864	76.1	1072	74.1
Missing	0	0.0	31	2.7	31	2.1
Income						
\$0-19999	69	22.3	266	23.4	335	23.2
\$20000 - 39999	78	25.2	276	24.3	354	24.5
\$40000 - 74999	68	21.9	288	25.4	356	24.6
\$75000 or more	27	8.7	139	12.2	166	11.5
Refused	68	21.9	167	14.7	235	16.3
Recruitment Source						
Gay Social Networking	29	9.4	13	1.1	42	2.9

General Gay Interest	42	13.6	36	3.2	78	5.4
General Social Networking	121	39.0	655	57.7	776	53.7
Geospatial Social Networking	118	38.1	432	38.0	550	38.0
HIV Test (Past 12 Months)						
Yes	170	54.8	706	62.2	876	60.6
No	140	45.2	430	37.9	570	39.4
Bacterial STI Diagnosis (Past 12 Months)						
Yes	33	10.7	147	18.0	180	12.4
No	277	89.4	989	82.0	1266	87.6
Number of Male Sexual Partners (Past 12 Months)						
One	66	21.3	227	20.0	293	20.3
Two to Five	113	36.5	335	29.5	448	31.0
Six to 10	62	20.0	193	17.0	255	17.6
More than 10	69	22.3	237	17.0	306	21.2
Refused	0	0.0	144	12.7	144	10.0
Serodiscordant Partner						
Yes	97	31.3	276	24.3	373	25.8
No	213	68.7	860	75.7	1073	74.2
Anal Intercourse without a condom (Past 12 months)						
Yes	199	64.2	777	68.4	976	67.5
No	111	35.8	359	31.6	470	32.5
Receptive anal Intercourse without a condom (Last sex)						
Yes	54	17.42	307	27.0	361	25.0
No	256	82.6	829	73.0	1085	73.0
Insertive anal intercourse without a condom (HIV positive partner; Last sex)						
Yes	4	1.3	17	1.5	21	1.5
No	306	98.7	1119	98.5	1425	98.6
Crystal Meth or Speed Use						
Yes	5	1.6	37	3.3	42	2.9
No	305	98.4	1099	96.7	1404	97.1
Injection drug use (Past 12 months)						
Yes	7	2.3	13	1.1	20	1.4
No	303	97.7	1123	98.9	1426	98.6

CDC Risk Score

< 10	181	58.4	602	53.0	783	54.2
> = 10	129	41.6	534	47.0	663	45.9

CDC PrEP Indicated

Yes	164	52.9	564	49.7	728	50.4
No	146	50.4	572	50.4	718	49.7

Table 2. Associations between participant characteristics awareness of PrEP among 1,426 HIV negative Hispanic/Latino Men, The American Men's Internet Survey (AMIS) 2013-2014

<i>Participant Characteristics</i>	<i>N</i>	Aware of PrEP			<i>P Value</i>	Prevalence Ratio			Adjusted ¹		
		<i>n</i>	<i>%</i>	<i>Cbisq</i>		<i>cPR</i>	<i>95% CI</i>	<i>aPR</i>	<i>95% CI</i>		
Year of Survey Completion				24.42	<.0001						
2013	293	124	42.3					REF			REF
2014	1133	662	58.4			1.38	1.20	1.59	1.40	1.21	1.63
<i>Total</i>	1426	786	55.1								
Age				34.11	<.0001						
15-24	375	162	43.2			0.78	0.67	0.9	0.85	0.75	0.98
25-29	281	168	59.8			1.08	0.95	1.22	1.00	0.88	1.13
30-39	356	226	63.5			1.14	1.02	1.28	1.02	0.91	1.15
40 +	414	230	55.6					REF			
Education				85.66	<.0001						
High School Diploma, Equivalent, or Less	192	54	28.1					REF			
Some College or Technical Degree	475	244	51.4			1.83	1.43	2.33	1.53	1.23	1.90
College Degree or Postgraduate Education	741	478	64.5			2.29	1.82	2.89	1.77	1.42	2.19
Insurance Status				51.94	<.0001						
None	185	94	50.8			0.82	0.71	0.95	0.88	0.76	1.02
Private Only	854	529	61.9					REF			REF
Public Only	145	60	41.4			0.67	0.55	0.82	0.80	0.67	0.95
Other/Multiple	113	59	52.2			0.84	0.70	1.01	0.87	0.73	1.04
Refused	129	44	34.1			0.55	0.43	0.70	0.69	0.56	0.86
Geographic Distribution				5.84	0.12						
Northeast	213	117	54.9			0.94	0.82	1.08			

Midwest	146	83	56.8		0.97	0.83	1.14			
South	506	259	51.2		0.88	0.78	0.98			
West	549	321	58.5				REF			
Population Density				26.89	<.0001					
Rural	335	145	43.3				REF			REF
Urban	1060	630	59.4		1.37	1.20	1.57	1.18	1.05	1.32
Income				35.99	<.0001					
\$0-19999	231	96	41.6				REF			
\$20000 - 39999	327	169	51.7		1.24	1.03	1.50			
\$40000 - 74999	351	218	62.1		1.49	1.26	1.78			
\$75000 or more	352	221	62.8		1.51	1.27	1.80			
Refused	165	82	49.7		1.20	0.96	1.49			
Recruitment Source				29.76	<.0001					
Gay Social Networking	40	18	45.0		0.92	0.64	1.30	1.08	0.82	1.42
General Gay Interest	75	43	57.3		1.17	0.95	1.44	1.22	1.01	1.48
General Social Networking	763	375	49.1				REF			REF
Geospatial Social Networking	548	350	63.9		1.30	1.18	1.43	1.22	1.11	1.35
HIV Test (Last 12 months)				61.86	<.0001					
Yes	867	550	63.4		1.50	1.35	1.68	1.19	1.08	1.32
No	559	236	42.2				REF			REF
Bacterial STI Diagnosis (Last 12 months)				29.34	<.0001					
Yes	180	133	73.9		1.41	1.27	1.56	1.15	1.02	1.30
No	1246	653	52.4				REF			REF

				63.16	<.0001						
Number of Male Sexual Partners (Last 12 months)											
One	291	120	41.2					REF			REF
Two to Five	439	217	49.4			1.20	1.01	1.42	1.14	0.99	1.31
Six to 10	252	149	59.1			1.43	1.21	1.70	1.20	1.02	1.42
More than 10	300	214	71.3			1.73	1.48	2.02	1.32	1.13	1.56
Refused	144	86	59.7			1.45	1.20	1.75	1.22	1.02	1.46
Serodiscordant Partner											
Yes	367	226	61.6	8.34	<0.001	1.16	1.05	1.29			
No	1059	560	52.9					REF			
				0.52	0.47						
Anal Intercourse without a condom (Last 12 months)											
Yes	960	555	57.8			1.17	1.05	1.30			
No	466	231	49.6					REF			
Receptive anal Intercourse without a condom (Last sex)											
Yes	355	207	58.3	1.95	0.16	1.08	0.97	1.20			
No	1071	579	54.1					REF			
Insertive anal Intercourse without a condom (Last sex; HIV positive partner)											
Yes	21	16	76.2	3.83	0.05	1.39	1.09	1.77			
No	1405	770	54.8					REF			
Crystal Meth or Speed Use											
Yes	42	31	73.8	6.11	0.01	1.35	1.12	1.63			

No	1384	755	54.6						REF			
Injection drug use (Last 12 months)				0.50	0.48							
Yes	19	12	63.2			1.15	0.81	1.62				
No	1407	774	55.0						REF			
CDC Risk Score				23.66	<.0001							
< 10	999	510	51.1						REF			REF
> = 10	427	276	64.6			1.26	1.15	1.39		1.15	1.04	1.27
CDC PrEP Indicated				23.99	<.0001							
Yes	713	439	61.6			1.27	1.15	1.39				
No	713	347	48.7						REF			

¹Adjusted for year of survey completion, age, urbanicity, recruitment source, HIV test in prior 12 months, recent bacterial STI, number of male sex partners, and CDC risk score.

Model selected using backwards elimination at 5% significance.

Hosmer and Lemeshow Goodness of Fit Test (Chi Square=6.42, P value = 0.60)

Table 3. Associations between participant characteristics and willingness to use PrEP among 1,098 HIV negative Hispanic/Latino Men, The American Men's Internet Survey (AMIS) 2013-2014

<i>Participant Characteristics</i>	<i>N</i>	Willing to Use PrEP		Prevalence Ratio			Adjusted¹			
		<i>n</i>	<i>%</i>	<i>ChiSq</i>	<i>p value</i>	<i>cPR</i>	<i>95% CI</i>	<i>aPR</i>	<i>95% CI</i>	<i>p value</i>
Year of Survey Completion				1.32	0.25					
2013	289	220	76.1					REF		
2014	809	642	79.4			1.04	0.97	1.12		
<i>Total</i>	1098	862	78.5							
Age				34.11	<.0001					
15-24	296	241	81.4			1.13	1.04	1.23		
25-29	211	176	83.4			1.16	1.06	1.27		
30-39	269	213	79.2			1.10	1.00	1.20		
40 +	322	232	72.0					REF		
Education				4.30	0.12					
High School Diploma, Equivalent, or Less	149	124	83.2					REF		
Some College or Technical Degree	364	291	79.9			0.96	0.88	1.05		
College Degree or Postgraduate Education	574	437	76.1			0.91	0.84	1.00		
Insurance Status				4.86	0.30					
None	132	104	78.8			1.02	0.93	1.13		
Private Only	668	515	77.1					REF		
Public Only	104	87	83.7			1.09	0.99	1.19		
Other/Multiple	87	74	85.1			1.10	1.00	1.22		
Refused	107	82	76.6			0.99	0.89	1.11		
Geographic Distribution				3.04	0.39					
Northeast	168	135	80.4			1.01	0.92	1.1		
Midwest	109	79	72.5			0.91	0.80	1.03		

South	391	306	78.3			0.98	0.91	1.05		
West	418	333	79.7						REF	
Population Density				1.11	0.29					
Rural	282	215	76.2						REF	
Urban	769	605	78.7			1.04	0.96	1.12		
Income				14.71	0.01					
\$0-19999	180	147	81.7						REF	
\$20000 - 39999	250	208	83.2			1.02	0.93	1.11		
\$40000 - 74999	274	211	77.0			0.94	0.86	1.04		
\$75000 or more	277	198	71.5			0.88	0.79	0.97		
Refused	117	98	83.8			1.03	0.92	1.14		
Recruitment Source				27.66	<.0001					
Gay Social Networking	34	26	76.5			1.06	0.88	1.28		
General Gay Interest	69	58	84.1			1.16	1.04	1.30		
General Social Networking	578	418	72.3						REF	
Geospatial Social Networking	396	339	85.6			1.19	1.18	1.43		
HIV Test in Last 12 Months				16.77	<.0001					
Yes	663	543	81.9			1.15	1.35	1.68	1.07	1.00
No	414	298	72.0						REF	REF
Recent Bacterial STI				18.10	<.0001					
Yes	135	125	92.6			1.21	1.14	1.28	1.13	1.04
No	963	737	76.5						REF	REF
Number of Male Sexual Partners (Last 12 Months)				73.52	<.0001					

One	228	136	59.6				REF			REF	
Two to Five	346	271	78.3			1.31	1.01	1.42	1.21	1.09	1.34
Six to 10	196	174	88.8			1.49	1.21	1.70	1.32	1.19	1.47
More than 10	225	196	87.1			1.47	1.48	2.02	1.26	1.12	1.42
Refused	82	64	78.0			1.32	1.20	1.75	1.24	1.10	1.41
Serodiscordant Partner				37.83	<.0001						
Yes	299	272	91.0			1.23	1.17	1.30	1.17	1.10	1.25
No	799	590	73.8					REF			REF
Anal Intercourse without a condom in last 12 months				0.52	0.47						
Yes	738	584	79.1			1.02	0.96	1.10			
No	360	278	77.2					REF			
Receptive anal Intercourse without a condom (Last sex)				7.75	0.01						
Yes	277	201	72.6			0.90	0.83	0.98	0.92	0.85	0.99
No	821	661	80.5					REF			REF
Insertive anal Intercourse without a condom (Last sex; HIV positive partner)				0.15	0.70						
Yes	17	14	82.4			1.05	0.84	1.31			
No	1081	848	78.4					REF			
Crystal Meth or Speed Use				1.77	0.18						
Yes	33	29	87.9			1.12	0.99	1.28			
No	1065	833	78.2					REF			
Injection drug use (Last 12 months)				1.7	0.19						

Yes	14	13	92.9			1.05	0.84	1.31
No	1084	849	78.3					REF
CDC Risk Score				1.86	0.17			
< 10	754	572	75.9					REF
> = 10	344	290	84.3			1.04	0.98	1.11
CDC PrEP Indicated				27.34	<.0001			
Yes	561	476	84.8			1.18	1.11	1.26
No	537	386	71.9					REF

¹Adjusted for HIV test in last 12 months, bacterial STI diagnosis in last 12 months, number of male sex partners, serodiscordant partner, and receptive anal intercourse without a condom (last sex).

Model selected using backwards elimination at 5% significance.

Hosmer and Lemeshow Goodness of Fit Test (Chi Square=4.54, P value = 0.80)

Table 4. Associations between participant characteristics and current use of PrEP among HIV negative 906 Hispanic/Latino Men, The American Men's Internet Survey (AMIS) 2013-2014

<i>Participant Characteristics</i>	<i>N</i>	Use PrEP		<i>ChiSq</i>	<i>P value</i>	Prevalence Ratio			Adjusted¹			
		<i>n</i>	<i>%</i>			<i>cPR</i>	<i>95% CI</i>		<i>aPR</i>	<i>95% CI</i>		<i>P value</i>
Year of Survey Completion				14.22	<0.001							
2013	292	4	1.4					REF				REF
2014	614	46	7.5			5.47	1.99	15.07	4.23	1.58		11.34
<i>Total</i>	906	50	5.5									
Age				6.71	0.08							
15-24	235	8	3.4			0.69	0.29	1.65				
25-29	176	9	5.1			1.04	0.45	2.39				
30-39	230	20	8.7			1.77	0.9	3.49				
40 +	265	13	4.9			REF	REF	REF				
Education				2.26	0.32							
High School Diploma, Equivalent, or Less	112	4	3.6									REF
Some College or Technical Degree	290	13	4.5			1.26	0.42	3.77				
College Degree or Postgraduate Education	496	32	6.5			1.81	0.65	5.01				
Insurance Status												
None	112	3	2.7	5.50	0.24	0.42	0.13	1.35				
Private Only	566	36	6.4									
Public Only	78	5	6.4			1.01	0.41	2.49				
Other/Multiple	73	5	6.8			1.08	0.44	2.66				
Refused	77	1	1.3			0.20	0.03	1.47				
Geographic Distribution				3.07	0.38							
Northeast	137	11	8.0			1.38	0.68	2.81				
Midwest	94	6	6.4			1.10	0.45	2.66				

South	319	13	4.1			0.70	0.35	1.39		
West	344	20	5.8						REF	
Population Density				8.52	<0.001					
Rural	230	4	1.7						REF	
Urban	657	45	6.8			3.94	1.43	10.84		
Income				3.05	0.55					
\$0-19999	137	5	3.6						REF	
\$20000 - 39999	198	12	6.1			1.66	0.60	4.61		
\$40000 - 74999	235	14	6.0			1.63	0.60	4.44		
\$75000 or more	236	16	6.8			1.86	0.70	4.96		
Refused	100	3	3.0			0.82	0.20	3.37		
Recruitment Source				9.67	0.02					
Gay Social Networking	34	2	5.9			1.57	0.38	6.54		
General Gay Interest	56	1	1.8			0.48	0.06	3.53		
General Social Networking	455	17	3.7						REF	
Geospatial Social Networking	361	30	8.3			2.22	1.25	3.97		
HIV Test (Last 12 months)				18.34	<.0001					
Yes	577	46	8.0			6.56	2.38	18.07	2.93	1.11
No	329	4	1.2						REF	REF
Bacterial STI Diagnosis (Last 12 months)				46.78	<.0001					
Yes	124	23	18.5			5.37	3.18	9.07	1.97	1.06
No	782	27	3.5						REF	
Number of Male Sexual Partners (Last 12 months)				59.40	<.0001					
One	180	1	0.6						REF	REF

Two to Five	275	3	1.1			1.96	1.01	1.42	1.56	0.17	14.55
Six to 10	159	8	5.0			9.06	1.21	1.7	4.49	0.62	32.32
More than 10	223	34	15.2			27.44	1.48	2.02	10.53	1.54	72.21
Refused	69	4	5.8			10.43	1.2	1.75	5.79	0.7	47.71
Serodiscordant Partner					20.30	<.0001					
Yes	255	28	11.0			3.25	1.89	5.58	1.81	1.04	3.16
No	651	22	3.4					REF			REF
Anal Intercourse without a condom (Last 12 months)					7.32	0.01					
Yes	623	43	6.9			2.79	1.27	6.13			
No	283	7	2.5					REF			
Receptive anal Intercourse without a condom (Last sex)					1.84	0.17					
Yes	234	17	7.3			1.48	0.84	2.61			
No	672	33	4.9					REF			
Insertive anal Intercourse without a condom (Last sex; HIV positive partner)					0.00	0.95					
Yes	17	1	5.9			1.07	0.16	7.30			
No	889	49	5.5					REF			
Crystal Meth or Speed Use					13.22	<0.001					
Yes	29	6	20.7			4.12	1.91	8.90			
No	877	44	5.0					REF			
Injection drug use (Last 12 months)					13.08	<0.001					
Yes	15	4	26.7			5.17	2.13	12.53			
No	891	46	5.2					REF			

CDC Risk Score				20.34	<.0001			
< 10	307	16	5.2					REF
> = 10	599	34	5.7			4.16	2.11	8.23
CDC PrEP Indicated				15.27	<.0001			
Yes	482	40	8.3			3.52	1.78	6.95
No	424	10	2.4					REF

¹Adjusted for year of survey completion, HIV test in last 12 months, bacterial STI diagnosis in last 12 months, number of male sex partners, and serdiscordant partner

Model selected using backwards elimination at 5% significance.

Hosmer and Lemeshow Goodness of Fit Test (Chi Square=10.81, P value = 0.21)

Appendix 1. Assessment of PrEP Questions by Study Year and Randomized Module

AMIS-2013

Respondents were shown the following text:

Researchers are studying whether anti-HIV medicine (also called antiretrovirals)--a pill-- could possibly be taken to prevent HIV infection.

PrEP awareness was then measured with the following question:

- *“Before today, have you ever heard of people who do not have HIV taking antiretroviral medications or anti-HIV medicines, a pill, to keep from getting HIV?”*

Willingness to use PrEP was then assessed with the following question:

- *“Would you be willing to take anti-HIV medicines every day to lower your chances of getting HIV?”*

Current use of PrEP was then assessed with the following question:

- *“In the past 12 months, have you taken anti-HIV medicines before sex because you thought it would keep you from getting HIV?”*

AMIS-2014 Module 1:

Respondents were shown the following text:

Researchers are studying whether antiretroviral medicines could possibly be taken to prevent HIV

PrEP awareness was then measured with the following question:

- *“Before today, have you ever heard of people who do not have HIV taking antiretroviral medications or anti-HIV medicines, a pill, to keep from getting HIV?”*

Current use of PrEP was then assessed with the following question:

- *“In the past 12 months, have you taken anti-HIV medicines before sex because you thought it would keep you from getting HIV?”*

Willingness to use PrEP was then assessed with the following question:

- *“Would you be willing to take anti-HIV medicines every day to lower your chances of getting HIV?”*

AMIS-2014 Module 2:

Respondents were shown the following text:

Pre-exposure prophylaxis (PrEP) is taking an antiretroviral pill, also called Truvada, every day for months or years to reduce a person’s chance of getting HIV.

PrEP awareness was then measured with the following question:

- *“Before today, have you ever heard of people who do not have HIV taking PrEP, the antiretroviral medicine taken every day for months or years to reduce the risk of getting HIV?”*
- *“In the past 12 months, have you taken PrEP to reduce the risk of getting HIV? Please remember that PrEP is the taking of pills every day for at least 2 months. Do not include times when you may have taken antiretroviral medicine for only a few days at a time.”*

Willingness to use PrEP was then assessed with the following question:

- *“Would you be willing to take anti-HIV medicines every day to lower your chances of getting HIV?”*

Appendix 2. SAS Programming Code

```
*****
Kelly Fletcher
Master's Thesis
Created: 12/07/2015
Updated: 4/17/2016
*****;

OPTIONS nofmterr;

libname t 'T:\epiprojs\Sex is the Question Data Share\Dataset for
Kelly';

*****
****
Create temporary dataset of Hispanic HIV negative/unknown status
men*;
*****
****;

*Get overall descriptive stats for exclusion criteria results*;
DATA work.amis;
SET t.sitq2013_2014_student_combined;
RUN;

PROC FREQ data=work.amis;
TABLES prep4 ;
WHERE hispanic =1;
RUN;

*Confirm sample is limited to just those reporting male sexual
contact in past 12 months*;
PROC FREQ data=work.amis;
TABLES m_sx12m M_MP12TYPE;
RUN;

*Overall no of latinos*;
PROC FREQ data=work.amis;
TABLES Hispanic;
RUN;

*Latinos HIV negative*;
PROC FREQ data=work.amis;
TABLES GROUP ;
WHERE _HIVSTAT ne 2 AND Hispanic =2 ;
RUN;

*HIV exclusions*;
PROC FREQ data=work.amis;
TABLES _HIVSTAT ;
WHERE Hispanic =2 ;
RUN;
```

***Create temp data set with newly created variables and exclude those ineligible*;

```
DATA work.amiscombined;
    SET t.sitq2013_2014_student_combined;

    *Exclude non-Hispanics*;
    IF hispanic ne 1 THEN delete;

    *Exclude hiv positive*;
    IF _hivstat = 2 THEN delete;

    *Exclude those not in group A 2013*;
    IF GROUP in ('B','C') THEN DELETE;

    *Separate 2013 and 2014 WANTHIVD variables*;
    IF (WANTHIVD in (1,9) AND YEAR = 2013) THEN WANTHIVD13 = 1;
    IF (WANTHIVD = 0 AND YEAR = 2013) THEN WANTHIVD13 = 0;
    IF (WANTHIVD = . AND YEAR = 2013) THEN WANTHIVD13 = .;

    IF (WANTHIVD in (1,9) AND YEAR = 2014) THEN WANTHIVD14 = 1;
    IF (WANTHIVD = 0 AND YEAR = 2014) THEN WANTHIVD14 = 0;
    IF (WANTHIVD = . AND YEAR = 2014) THEN WANTHIVD14 = .;

    *Separate 2013 and 2014 AHMPRESX variables*;
    IF (AHMPRESX = 1 AND YEAR = 2013) THEN AHMPRESX13 = 1;
    IF (AHMPRESX in (0,9) AND YEAR = 2013) THEN AHMPRESX13 = 0;
    IF (AHMPRESX = . AND YEAR = 2013) THEN AHMPRESX13 = .;

    IF (AHMPRESX = 1 AND YEAR = 2014) THEN AHMPRESX14 = 1;
    IF (AHMPRESX in (0,9) AND YEAR = 2014) THEN AHMPRESX14 = 0;
    IF (AHMPRESX = . AND YEAR = 2014) THEN AHMPRESX14 = .;

    *Treat refused to answer prep questions as missing*;
    IF ANTRPREV = 7 THEN ANTRPREV = .;
    IF WANTHIVD = 7 THEN WANTHIVD = .;
    IF AHMPRESX = 7 THEN AHMPRESX = .;
    IF ANTRPREV1 = 7 THEN ANTRPREV1 = .;
    IF PREP1 = 7 THEN PREP1 = .;
    IF PREP4 = 7 THEN PREP4 = .;
    IF PREP5 = 7 THEN PREP5 = .;

    *Combine two 2013 PREP awareness questions*;
    IF ANTRPREV = 1 THEN _aware2013 = 1;
    IF ANTRPREV in (0,9) THEN _aware2013 = 0;
    IF ANTRPREV = . THEN _aware2013 = .;
```

```

*Combine two 2013 PREP awareness questions*;
IF WANTHIVD13 in (1,9) THEN _will2013 = 1;
IF WANTHIVD13 = 0 THEN _will2013 = 0;
IF WANTHIVD13 = . THEN _will2013 = .;

*Combine two 2013 PREP awareness questions*;
IF AHMPRESX13 in (0,9) THEN _use2013 = 0;
IF AHMPRESX13 = 1 THEN _use2013 = 1;
IF AHMPRESX13 = . THEN _use2013 = .;

****2014****;

*Combine two 2014 PREP awareness questions*;
IF (ANTRPREV1 = 1 OR PREP1 = 1) THEN
  _aware2014 = 1;
IF (ANTRPREV1 in (0,9) OR PREP1 in (0,9)) THEN
  _aware2014 = 0;
IF (ANTRPREV1 = . AND PREP1 = .) THEN
  _aware2014 = .;

*Combine two 2014 PREP willingness questions*;
IF (WANTHIVD14 in (1,9) OR PREP5 in (1,9)) THEN
  _will2014 = 1;
IF (WANTHIVD14 = 0 OR PREP5 = 0) THEN
  _will2014 = 0;
IF (WANTHIVD14 = . AND PREP5 = .) THEN
  _will2014 = .;

*Combine two 2014 PreP Use questions*;
IF (AHMPRESX14 = 1 OR PREP4 = 1)
  THEN _use2014 = 1;
IF (AHMPRESX14 in (0,9) OR PREP4 in (0,9)) THEN
  _use2014 = 0;
IF (AHMPRESX14 = . AND PREP4 = .)
  THEN _use2014 = .;

*Create Single PreP Awareness Variable*;
IF _aware2013 = 1 OR _aware2014 = 1 THEN _prepaware =
1;
IF _aware2013 = 0 OR _aware2014 = 0 THEN _prepaware =
0;
IF _aware2013 = . AND _aware2014 = . THEN _prepaware =
.;

IF _will2013 = 1 OR _will2014 = 1 THEN _prepwil = 1;
IF _will2013 = 0 OR _will2014 = 0 THEN _prepwil = 0;
IF _will2013 = . AND _will2014 = . THEN _prepwil = .;

IF _use2013 = 1 OR _use2014 = 1 THEN _prepuse = 1;
IF _use2013 = 0 OR _use2014 = 0 THEN _prepuse = 0;
IF _use2013 = . AND _use2014 = . THEN _prepuse = .;

```

```

*Recode Prep Use to PrepWilling*;
IF _prepuse = 1 THEN _prepwil = 1;

*Collapse census division to four major census regions*;

IF _censdiv in (1,2) THEN region = 1; *Northeast Region (New
England and Mid Atlantic);
IF _censdiv in (3,4) THEN region = 2; *Midwest Region (East North
Central, West North Central);
IF _censdiv in (5,6,7,10) THEN region = 3; *South Region (South
Atlantic, East South Central, West South Central, Territories);
IF _censdiv in (8,9) THEN region = 4; *West Region (Mountain,
Pacific);

*Collapse education*;
IF _educat in (1,2) THEN _education = 1; *High school diploma or
less*;
IF _educat = 3 THEN _education = 2; *Some College*;
IF _educat = 4 THEN _education = 3; *College degree or post
graduate*;

*Recreate male sex partner categories*;

if m_sx12m=0 then _partners=0;
if m_sx12m=1 then _partners=1;
if m_sx12m ge 2 AND m_sx12m le 5 then _partners=2;
if m_sx12m ge 6 AND m_sx12m le 10 then _partners=3;
if m_sx12m > 10 and m_sx12m not in(7777,9999) then _partners=4;

*Create no of male sex partners categorical variable*;
If M_MP12TYPE = 1 then do;

        if M_MP12ONUM = 1 then _partners = 1;
        if M_MP12ONUM ge 2 AND M_MP12ONUM le 5 then _partners
= 2;
        if M_MP12ONUM ge 6 AND M_MP12ONUM le 10 then
_partners = 3;
        if M_MP12ONUM gt 10 then _partners = 4;
        if M_MP12ONUM =. then _partners = 5;
    end;

If M_MP12TYPE = 2 then do;

        if M_MP12ANUM = 1 then _partners = 1;
        if M_MP12ANUM ge 2 AND M_MP12ANUM le 5 then _partners
= 2;
        if M_MP12ANUM ge 6 AND M_MP12ANUM le 10 then
_partners = 3;
        if M_MP12ANUM gt 10 then _partners = 4;
        if M_MP12ANUM =. then _partners = 5;
    end;

```

```

If M_MP12TYPE = 3 then do;
    if M_MP12OANUM = 1 then _partners = 1;
    if M_MP12OANUM ge 2 AND M_MP12OANUM le 5 then
    _partners = 2;
    if M_MP12OANUM ge 6 AND M_MP12OANUM le 10 then
    _partners = 3;
    if M_MP12OANUM gt 10 then _partners = 4;
    if M_MP12OANUM = . then _partners = 5;

    end;

If M_MP12TYPE = 4 then _partners = 0;
If M_MP12TYPE in (7,9) then _partners= .;

*Create new age cat*;
IF age ge 15 AND age le 24 THEN _age = 1;
IF age ge 25 AND age le 29 THEN _age = 2;
IF age ge 30 AND age le 39 THEN _age = 3;
IF age ge 40 THEN _age = 4;
IF age = . THEN _age = .;

*Set 77 and 99 and missing income to refused category*;
IF hhincom in (77,99, .) THEN hhincom = 4;

*Set 77 and 99 and missing income to refused category*;
IF _inscat in (77,99, .) THEN _inscat = 5;

*Create recent 2013 bacterial sti variable*;
_bacsti = 0;
IF SYPHILIS = 1 THEN _bacsti = 1;
IF GONORR = 1 THEN _bacsti = 1;
IF CHLMYD = 1 THEN _bacsti = 1;
IF bstia = 1 THEN _bacsti = 1;
IF bstib=1 then _bacsti = 1;
IF bstic=1 then _bacsti =1;

*Combine 2013 and 2014 variables for condomless anal
intercourse*;

_uas = 0;
IF uas=1 THEN _uas=1;
IF _m_m_uas = 1 THEN _uas = 1;

*Combine d2013 and 2014 variables for serodiscordant partner*;

_discord = 0;
IF uas_discord = 1 THEN _discord = 1;
IF uas_discord12 = 1 THEN _discord = 1;

*Create receptive anal intercourse without a condom whole time
variable;

```



```

_raslastsex = 0;
IF M_MLRAS = 1 AND M_MLRASC = 0 THEN _raslastsex = 1;

*UAS among only those who had RAI last sex*;
IF M_MLRAS = 1 AND M_MLRASC = 0 THEN _uasr = 1;
IF M_MLRAS = 1 AND M_MLRASC ne 0 THEN _uasr = 0;
IF M_MLRAS ne 1 THEN _uasr = 2; *Was . before*;

*Create insertive anal intercourse without a condom variable;

_iaslastsex = 0;
      IF M_MLIASC=0 and M_MLHIV=2 THEN _iaslastsex=1;
      ELSE _iaslastsex=0;

*Combined 2013 and 2014 drug use vars*;

_meth = 0;
IF (NIUSEG=1 OR NIU12F = 1) THEN _meth = 1;

*Recode last sex receptive anal intercourse 2 to be no to be
consistent with 2013 coding scheme*;

**PrEP Eligibility Risk score;
  *Age;
  if age<18 then score1 = 0;
  if 18<=age<=28 then score1 = 8;
  if 29<=age<=40 then score1 = 5;
  if 41<=age<=48 then score1 = 2;
  if age=>49 then score1 = 0;

  *In the last 12 months, how many men have you had sex
with?;
  IF _partners in (1,2,5) THEN score2 = 0;
  IF _partners = 3 THEN score2 = 4;
  IF _partners = 4 THEN score2 = 7;

  *In how many times did you have RAS without condom;
  score3 = 0;
  IF M_MLRAS = 1 THEN DO;
    IF M_MLRASC = 0 THEN score3 = 10;
  END;

  *In how many male sex partners were HIV-positive;
  score4 = 0;
  IF (M_MM1HST = 2 OR M_M1HST) = 2 THEN score4 = 4;
*2013 and 2014 vars*;
  IF M_MUAHP = 1 THEN score4 = 4;
  IF M_MLHIV = 2 THEN score4 = 4; /*All are coded as 4
(midpoint) because we don't have the number of partners, just if
they had one or not.*/

```

```

    *In how many times have IAS w/o condom with HIV-positive
partner?;
    IF M_MLIASC=0 and M_MLHIV=2 THEN score5=1;
    ELSE score5=0;

    *In did you use crystal meth or speed?;
    score6 = 0;
    IF (NIUSEG=1 OR NIU12F = 1) THEN score6=6;

risk_score_low = sum (of score1-score6); *Assumes <5 times IAS
w/o condom with HIV-positive partner;
risk_score_high = sum (score1, score2, score3, score4, score5*6,
score6); *Assumes >5 times IAS w/o condom with HIV-positive
partner;

IF risk_score_low=>10 THEN prep_score_low = 1;
    ELSE prep_score_low = 0;

IF risk_score_high=>10 THEN prep_score_high = 1;
    ELSE prep_score_high = 0;

    *create binary drug use variable*;
    IF AVGINJ ge 1 THEN _IDU = 1;
    ELSE _IDU= 0;

    *create year variable*;
    IF year = '2013' THEN _year = 0;
    Else _year = 1;

*Prep Eligibility Criteria****;

    mainHIVp=0;
    prep_eligible = 0;

*2014 male partners*;
    If M_MP12TYPE = 3 then do;
        if M_MP12OANUM = 1 then _m_m_no=1 ;
        else if M_MP12OANUM=>2 then _m_m_no=2;
    end;

    else If M_MP12TYPE = 1 then do;
        if M_MP12ONUM = 1 then _m_m_no=1 ;
        else if M_MP12ONUM=>2 then _m_m_no=2;
    end;

    else If M_MP12TYPE = 1 then do;
        if M_MP12ANUM = 1 then _m_m_no=1 ;
        else if M_MP12ANUM=>2 then _m_m_no=2;
    end;

    else if M_MP12TYPE = 4 then _m_m_no = 0;

    if _m_m_no=1 then do;
        if M_M1SX=1 and M_M1HST=2 then mainHIVp = 1;
    end;

```

```

if _m_m_no=2 then do;
    if M_MUAHP=1 and M_MTYP=1 then mainHIVp = 1;
    else if M_MLMC=1 and M_MLHIV=2 then mainHIVp = 1;
END;

*2013 male partners*;
if m_sx12m=0 then _m_m_no=0;
if m_sx12m=1 then _m_m_no=1;
if m_sx12m=>2 then _m_m_no=2;

if _m_m_no=1 then do;
    if M_M1SX=1 and M_MM1HST=2 then mainHIVp = 1;
end;

if _m_m_no=2 then do;
    if M_MUAHP=1 and M_MTYP=1 then mainHIVp = 1;
    else if M_MLMC=1 and M_MLHIV=2 then mainHIVp = 1;
end;

*Determine PrEP eligibility;

if _m_m_no=1 then do;
    if mainHIVp = 1 then prep_eligible = 1;
end;
else if _m_m_no=>2 then do;
    if mainHIVp = 1 or _bacsti=1 or _uas=1 then
prep_eligible = 1;
end;

if age<18 then prep_eligible = 0;

RUN;

*Check creation of WANTHIVD*;

PROC FREQ data=work.amiscombined;
    TABLES wanthivd*year wanthivd13 wanthivd14;
RUN;

*Check creation of AHMPRESX*;

PROC FREQ data=work.amiscombined;
    TABLES AHMPRESX*year AHMPRESX13 AHMPRESX14 PREP5;
RUN;

*Get Proportions of PrEP variables for correlation statistics*;
PROC FREQ data=work.amiscombined;
    TABLES ANTRPREV1 PREP1 WANTHIVD14 PREP5 AHMPRESX14 PREP4;
RUN;

```

```

*Enter 2014 awareneess proportions into a new dataset*;
DATA work.correlation;
    INPUT aware$ random$ count @@;
    DATALINES;
Yes Group1 362 Yes Group2 327
No Group1 220 No Group2 259
;
RUN;

*2014 correlation for awareness*;
PROC FREQ data=work.correlation;
    TABLES random*aware / CHISQ;
    WEIGHT count;
RUN;
****CHI SQUARE value 4.94, p value 0.026*** Reject the null.

```

```

*Enter 2014 willingness proportions into a new dataset*;
DATA work.correlation2;
    INPUT willing$ random$ count @@;
    DATALINES;
Yes Group1 432 Yes Group2 189
No Group1 107 No Group2 60
;
RUN;

*2014 correlation for willingness*;
PROC FREQ data=work.correlation2;
    TABLES random*willing / CHISQ;
    WEIGHT count;
RUN;
*Chi Square = 1.8375, p value = 0.1896*;

```

```

*Enter 2014 use proportions into a new dataset*;
DATA work.correlation3;
    INPUT use$ random$ count @@;
    DATALINES;
Yes Group1 25 Yes Group2 21
No Group1 522 No Group2 46
;
RUN;

*2014 correlation for use*;
PROC FREQ data=work.correlation3;
    TABLES random*use / CHISQ;
    WEIGHT count;
RUN;

```

```

*Check creation of new variables*;

PROC FREQ data=work.amiscombined;
TABLES _use2014*year _will2014*Year _aware2014*Year _use2013*year
_will2013*year _aware2013*year/ missing;
RUN;

PROC FREQ data=work.amiscombined;
TABLES _prepaware _prepwil _prepuse / missing;
RUN;

*Check Excluded Variables*;
PROC FREQ data=work.amiscombined;
TABLES GROUP _HIVSTAT hispanic;
RUN;

PROC FREQ data=work.amiscombined;
TABLES GROUP*WANTHIVD GROUP*ANTRPREV GROUP*AHMPRESX;
WHERE YEAR = 2013;
RUN;

PROC FREQ data=work.amiscombined;
TABLES WANTHIVD*Year ANTRPREV*Year AHMPRESX*Year
ANTRPREV1*Year PREP1*Year PREP5*Year PREP4*Year / missing;
RUN;

*Explore Contents of Combined Dataset*;
PROC CONTENTS data=work.amiscombined;
RUN;

*****
DESCRIPTIVE STATISTICS AND DEMOGRAPHICS
*****;

*TABLE 1: Explore Characterstics and Demographics BY YEAR:

(_Education)
_inscat)
Region (Region)

*Year (Year)
Age (_age)
Education Level
Insurance status(
Geographical

```

```

rural)
Source (site_type)
12 Months ( _lasthivtest12)
in 12 months ( _partners)
intercourse in 12 months ( _uas)
sex w/male partner of discordant or unknown HIV
(_discord)
(_bacsti)
(prepare_score_high)
(prepare_eligible)
condom last sex (_raslastsex)
intercourse last sex (_iaslastsex)
(_meth)
use (_IDU);
Rural or Urban (
Income (hhincom)
Recruitment
HIV test in last
No male partners
Unprotected anal
Unprotected anal
status.
Bacterial STI
Risk score
Prep eligibility
RAS without
Insertive anal
Meth or drug use
Injection drug

```

```

PROC FREQ data=work.amiscombined;
    TABLES _age*year _education*year _inscat*year region*year
rural*year hhincom*year site_type*year
        _lasthivtest12*year _partners*year _uas*year
_discord*year _bacsti*year _raslastsex*year _iaslastsex*year
_meth*year prepare_score_high*year _IDU*year prepare_eligible*year;
RUN;

```

```

*****
DESCRIPTIVE STATISTICS - OUTCOME VARIABLES by INDEPENDENT VARS
*****;

```

```

*Frequencies of Outcome variables by Year*;
PROC FREQ data=work.amiscombined;
    TABLES _prepareaware*year _preparewill*year _prepareuse*year;
RUN;

```

```

*Outcome variables by Age*;
PROC FREQ data=work.amiscombined;
    TABLES _age*_prepareaware _age*_preparewill _age*_prepareuse /
chisq;
RUN;

```

```

*Outcome variables by Education*;

```

```

PROC FREQ data=work.amiscombined;
    TABLES _education*_prepaware _education*_prepwil
_education*_prepuse / chisq;
RUN;

*Outcome variables by Insurance*;
PROC FREQ data=work.amiscombined;
    TABLES _inscat*_prepaware _inscat*_prepwil
_inscat*_prepuse / chisq;
RUN;

*Outcome variables by census region*;
PROC FREQ data=work.amiscombined;
    TABLES region*_prepaware region*_prepwil region*_prepuse /
chisq;
RUN;

*Outcome variables by income*;
PROC FREQ data=work.amiscombined;
    TABLES hhincom*_prepaware hhincom*_prepwil
hhincom*_prepuse / chisq;
RUN;

*Outcome variables by rural*;
PROC FREQ data=work.amiscombined;
    TABLES rural*_prepaware rural*_prepwil rural*_prepuse /
chisq;
RUN;

*Outcome variables by site_type*;
PROC FREQ data=work.amiscombined;
    TABLES site_type*_prepaware site_type*_prepwil
site_type*_prepuse / chisq;
RUN;

*Outcome variables by last hiv test*;
PROC FREQ data=work.amiscombined;
    TABLES _lasthivtest12*_prepaware _lasthivtest12*_prepwil
_lasthivtest12*_prepuse / chisq;
RUN;

*Outcome variables by number of male partners*;
PROC FREQ data=work.amiscombined;
    TABLES _partners*_prepaware _partners*_prepwil
_partners*_prepuse / chisq;
RUN;

*Outcome variables by number of unprotected anal intercourse*;
PROC FREQ data=work.amiscombined;
    TABLES _uas*_prepaware _uas*_prepwil _uas*_prepuse /
chisq;
RUN;

```

```

*Outcome variables by serodiscordant partners*;
PROC FREQ data=work.amiscombined;
    TABLES _discord*_prepaware _discord*_prepwil
_discord*_prepuse / chisq;
RUN;

*Outcome variables by recent bacterial st*;
PROC FREQ data=work.amiscombined;
    TABLES _bacsti*_prepaware _bacsti*_prepwil
_bacsti*_prepuse / chisq;
RUN;

*Outcome variables by PrEP risk score*;
PROC FREQ data=work.amiscombined;
    TABLES prep_score_high*_prepaware prep_score_high*_prepwil
prep_score_high*_prepuse / chisq;
RUN;

*Outcome variables by raslastsex*;
PROC FREQ data=work.amiscombined;
    TABLES _raslastsex*_prepaware _raslastsex*_prepwil
_raslastsex*_prepuse / chisq;
RUN;

*Outcome variables by iaslastsex*;
PROC FREQ data=work.amiscombined;
    TABLES _iaslastsex*_prepaware _iaslastsex*_prepwil
_iaslastsex*_prepuse / chisq;
RUN;

*Outcome variables by meth*;
PROC FREQ data=work.amiscombined;
    TABLES _meth*_prepaware _meth*_prepwil _meth*_prepuse /
chisq;
RUN;

*Outcome variables by IDU*;
PROC FREQ data=work.amiscombined;
    TABLES _IDU*_prepaware _IDU*_prepwil _IDU*_prepuse /
chisq;
RUN;

*Outcome variables by prep_eligible*;
PROC FREQ data=work.amiscombined;
    TABLES prep_eligible*_prepaware prep_eligible*_prepwil
prep_eligible*_prepuse / chisq;
RUN;

*Outcome by UAS RAS only*;
PROC FREQ data=work.amiscombined;
    TABLES _uasr*_prepaware _uasr*_prepwil _uasr*_prepuse /
chisq;
RUN;

```



```

*****
*****
SUDAAN - Predicted Margins CRUDE Prevalence Ratios : _PREPAWARE
*****
*****;

```

```
options ls=132;
```

```
*Age*;
```

```

PROC RLOGIST data=work.amiscombined design=srs;
    CLASS _age;
    REFLEV _age = 4;
    MODEL _prepaware = _age;
    PREDMARG _age(4) / adjrr;
RUN;

```

```
*Year*;
```

```

PROC RLOGIST data=work.amiscombined design=srs;
    CLASS year;
    REFLEV year = 2013;
    MODEL _prepaware = year;
    PREDMARG year(2013) / adjrr;
RUN;

```

```
*Education*;
```

```

PROC RLOGIST data=work.amiscombined design=srs;
    CLASS _education;
    REFLEV _education = 1;
    MODEL _prepaware = _education;
    PREDMARG _education(1) / adjrr;
RUN;

```

```
*Insurance Status*;
```

```

PROC RLOGIST data=work.amiscombined design=srs;
    CLASS _inscat;
    REFLEV _inscat = 2;
    MODEL _prepaware = _inscat;
    PREDMARG _inscat(2) / adjrr;
RUN;

```

```
*Census Region*;
```

```

PROC RLOGIST data=work.amiscombined design=srs;
    CLASS region;
    REFLEV region = 4;
    MODEL _prepaware = region;
    PREDMARG region(4) / adjrr;
RUN;

```

```

*Pop density*;

PROC RLOGIST data=work.amiscombined design=srs;
  CLASS rural;
  REFLEV rural = 1;
  MODEL _prepaware = rural;
  PREDMARG rural (1) / adjrr;
RUN;

*Income*;

PROC RLOGIST data=work.amiscombined design=srs;
  CLASS hhincom;
  REFLEV hhincom = 0;
  MODEL _prepaware = hhincom;
  PREDMARG hhincom (0) / adjrr;
RUN;

*Site Type*;

PROC RLOGIST data=work.amiscombined design=srs;
  CLASS site_type;
  REFLEV site_type = 3;
  MODEL _prepaware = site_type;
  PREDMARG site_type (3) / adjrr;
RUN;

*HIVTEST*;

PROC RLOGIST data=work.amiscombined design=srs;
  CLASS _lasthivtest12;
  REFLEV _lasthivtest12 = 0;
  MODEL _prepaware = _lasthivtest12;
  PREDMARG _lasthivtest12 (0) / adjrr;
RUN;

*Number of sex partners*;

PROC RLOGIST data=work.amiscombined design=srs;
  CLASS _partners;
  REFLEV _partners = 1;
  MODEL _prepaware = _partners;
  PREDMARG _partners (1) / adjrr;
RUN;

*Unprotected Anal INtercourse last 12 months*;

PROC RLOGIST data=work.amiscombined design=srs;
  CLASS _uas;
  REFLEV _uas = 0;
  MODEL _prepaware = _uas;
  PREDMARG _uas (0) / adjrr;
RUN;

```

```

*Discordant Partner*;

PROC RLOGIST data=work.amiscombined design=srs;
  CLASS _discord;
  REFLEV _discord = 0;
  MODEL _prepaware = _discord;
  PREDMARG _discord (0) / adjrr;
RUN;

*Bacterial STI*;

PROC RLOGIST data=work.amiscombined design=srs;
  CLASS _bacsti;
  REFLEV _bacsti = 0;
  MODEL _prepaware = _bacsti;
  PREDMARG _bacsti (0) / adjrr;
RUN;

*PrEP Score*;

PROC RLOGIST data=work.amiscombined design=srs;
  CLASS prep_score_high;
  REFLEV prep_score_high = 0;
  MODEL _prepaware = prep_score_high;
  PREDMARG prep_score_high (0) / adjrr;
RUN;

*Receptive anal intercourse last sex*;

PROC RLOGIST data=work.amiscombined design=srs;
  CLASS _raslastsex;
  REFLEV _raslastsex = 0;
  MODEL _prepaware = _raslastsex;
  PREDMARG _raslastsex (0) / adjrr;
RUN;

*UAS among those who had last sex RAI*;

PROC RLOGIST data=work.amiscombined design=srs;
  CLASS _uasr;
  REFLEV _uasr = 0;
  MODEL _prepaware = _uasr;
  PREDMARG _uasr (0) / adjrr;
RUN;

*Meth*;

PROC RLOGIST data=work.amiscombined design=srs;
  CLASS _meth;
  REFLEV _meth = 0;
  MODEL _prepaware = _meth;
  PREDMARG _meth (0) / adjrr;
RUN;

*Injection Drug Use*;

PROC RLOGIST data=work.amiscombined design=srs;

```

```

        CLASS _IDU;
        REFLEV _IDU = 0;
        MODEL _prepaware = _IDU;
        PREDMARG _IDU (0) / adjrr;
RUN;

*Insertive anal intercourse last sex;
PROC RLOGIST data=work.amiscombined design=srs;
    CLASS _iaslastsex;
    REFLEV _iaslastsex = 0;
    MODEL _prepaware = _iaslastsex;
    PREDMARG _iaslastsex (0) / adjrr;
RUN;

*Prep Eligibility*;

PROC RLOGIST data=work.amiscombined design=srs;
    CLASS prep_eligible;
    REFLEV prep_eligible = 0;
    MODEL _prepaware = prep_eligible;
    PREDMARG prep_eligible(0) / adjrr;
RUN;

*****
Model Selection and Goodness of Fit: PREPAWARE
*****;

*Backwards at p value 5%*;

PROC LOGISTIC data=work.amiscombined descending;
    CLASS _age _education _inscat hhincom site_type
    _partners;
    MODEL _prepaware = year _age _education _inscat rural
    hhincom site_type _lasthivtest12 _bacsti _partners
    prep_score_high prep_eligible _discord _meth/
        SELECTION = backward SLSTAY =.05
        DETAILS
        LACKFIT;
    TITLE 'Backwards Elimination, PrEP Awareness';
RUN;

*****Final model for year selected by 5% backwards includes: year
_age _educat _inscat rural site_type _lasthivtest12 _bacsti
_partners prep_score_high *;
***Results of HL test not significant so no evidence of lack of
fit*****;

```

```

*****
*****
SUDAAN - Predicted Margins ADJUSTED Prevalence Ratios using
selected model : _PREPAWARE
*****
*****;

```

```
options ls=132;
```

```
*Year*;
```

```

PROC RLOGIST data=work.amiscombined design=srs;
    CLASS _year age _education _in scat site_type _partners;
    REFLEV _year = 0;
    MODEL _prepaware = _year _age _education _in scat rural
site_type _lasthivtest12 _bacsti _partners prep_score_high;
    PREDMARG _year(0) / adjrr;
RUN;

```

```
*Age*;
```

```

PROC RLOGIST data=work.amiscombined design=srs;
    CLASS _age _year _education _in scat site_type _partners;
    REFLEV _age = 4;
    MODEL _prepaware = _age _year _education _in scat rural
site_type _lasthivtest12 _bacsti _partners prep_score_high;
    PREDMARG _age(4) / adjrr;
RUN;

```

```
*Education*;
```

```

PROC RLOGIST data=work.amiscombined design=srs;
    CLASS _education _age _year _in scat site_type _partners;
    REFLEV _education = 1;
    MODEL _prepaware = _education _year _age _in scat rural
site_type _lasthivtest12 _bacsti _partners prep_score_high;
    PREDMARG _education(1) / adjrr;
RUN;

```

```
*Insurance Status*;
```

```

PROC RLOGIST data=work.amiscombined design=srs;
    CLASS _in scat _education _age _year site_type _partners;
    REFLEV _in scat = 2;

```

```

        MODEL _prepaware = _in scat _year _age _education rural
site_type _lasthivtest12 _bacsti _partners prep_score_high;
        PREDMARG _in scat(2) / adjrr;
RUN;

*Rural*;

PROC RLOGIST data=work.amiscombined design=srs;
        CLASS rural _in scat _education _age _year site_type
        _partners;
        REFLEV rural = 1;
        MODEL _prepaware = rural _year _age _education _in scat
site_type _lasthivtest12 _bacsti _partners prep_score_high;
        PREDMARG rural (1) / adjrr;
RUN;

*Site Type*;

PROC RLOGIST data=work.amiscombined design=srs;
        CLASS site_type _in scat _education _age _year _partners;
        REFLEV site_type = 3;
        MODEL _prepaware = site_type _year _age _education _in scat
rural _lasthivtest12 _bacsti _partners prep_score_high;
        PREDMARG site_type (3) / adjrr;
RUN;

*HIVTEST*;

PROC RLOGIST data=work.amiscombined design=srs;
        CLASS _lasthivtest12 site_type _in scat _education _age
        _year _partners;
        REFLEV _lasthivtest12 = 0;
        MODEL _prepaware = _lasthivtest12 _year _age _education
_in scat rural site_type _bacsti _partners prep_score_high;
        PREDMARG _lasthivtest12 (0) / adjrr;
RUN;

*Number of sex partners*;

PROC RLOGIST data=work.amiscombined design=srs;
        CLASS _partners site_type _in scat _education _age _year;
        REFLEV _partners = 1;
        MODEL _prepaware = _partners _year _age _education _in scat
rural site_type _lasthivtest12 _bacsti prep_score_high;
        PREDMARG _partners (1) / adjrr;
RUN;

*Bacterial STI*;

PROC RLOGIST data=work.amiscombined design=srs;
        CLASS _bacsti _partners site_type _in scat _education _age
        _year;

```

```

REFLEV _bacsti = 0;
MODEL _prepaware = _bacsti _year _age _education _inscat
rural site_type _lasthivtest12 _partners prep_score_high ;
PREDMARG _bacsti (0) / adjrr;
RUN;

```

PrEP Score;

```

PROC RLOGIST data=work.amiscombined design=srs;
CLASS prep_score_high _partners site_type _inscat
_education _age _year;
REFLEV prep_score_high = 0;
MODEL _prepaware = prep_score_high _bacsti _year _age
_education _inscat rural site_type _lasthivtest12 _partners;
PREDMARG prep_score_high (0) / adjrr;
RUN;

```

```

*****PREP
WILLING*****

```

```

*****
*****
SUDAAN - Predicted Margins CRUDE Prevalence Ratios : _PREPWILL
*****
*****;

```

```
options ls=132;
```

Age;

```

PROC RLOGIST data=work.amiscombined design=srs;
CLASS _age;
REFLEV _age = 4;
MODEL _PREPWILL = _age;
PREDMARG _age(4) / adjrr;
RUN;

```

Year;

```
PROC RLOGIST data=work.amiscombined design=srs;
```

```

        CLASS year;
        REFLEV year = 2013;
        MODEL _PREPWILL = year;
        PREDMARG year(2013) / adjrr;
RUN;

*Education*;

PROC RLOGIST data=work.amiscombined design=srs;
    CLASS _education;
    REFLEV _education = 1;
    MODEL _PREPWILL = _education;
    PREDMARG _education(1) / adjrr;
RUN;

*Insurance Status*;

PROC RLOGIST data=work.amiscombined design=srs;
    CLASS _inscat;
    REFLEV _inscat = 2;
    MODEL _PREPWILL = _inscat;
    PREDMARG _inscat(2) / adjrr;
RUN;

*Census Region*;

PROC RLOGIST data=work.amiscombined design=srs;
    CLASS region;
    REFLEV region = 4;
    MODEL _prepwill = region;
    PREDMARG region(4) / adjrr;
RUN;

*Urbanicity*;

PROC RLOGIST data=work.amiscombined design=srs;
    CLASS rural;
    REFLEV rural = 1;
    MODEL _PREPWILL = rural;
    PREDMARG rural (1) / adjrr;
RUN;

*Income*;

PROC RLOGIST data=work.amiscombined design=srs;
    CLASS hhincom;
    REFLEV hhincom = 0;
    MODEL _PREPWILL = hhincom;
    PREDMARG hhincom (0) / adjrr;
RUN;

*Site Type*;

PROC RLOGIST data=work.amiscombined design=srs;
    CLASS site_type;
    REFLEV site_type = 3;

```



```

MODEL _PREPWILL = site_type;
PREDMARG site_type (3) / adjrr;
RUN;

*HIVTEST*;

PROC RLOGIST data=work.amiscombined design=srs;
CLASS _lasthivtest12;
REFLEV _lasthivtest12 = 0;
MODEL _PREPWILL = _lasthivtest12;
PREDMARG _lasthivtest12 (0) / adjrr;
RUN;

*Number of sex partners*;

PROC RLOGIST data=work.amiscombined design=srs;
CLASS _partners;
REFLEV _partners = 1;
MODEL _PREPWILL = _partners;
PREDMARG _partners (1) / adjrr;
RUN;

*Unprotected Anal INtercourse last 12 months*;

PROC RLOGIST data=work.amiscombined design=srs;
CLASS _uas;
REFLEV _uas = 0;
MODEL _PREPWILL = _uas;
PREDMARG _uas (0) / adjrr;
RUN;

*Discordant Partner*;

PROC RLOGIST data=work.amiscombined design=srs;
CLASS _discord;
REFLEV _discord = 0;
MODEL _PREPWILL = _discord;
PREDMARG _discord (0) / adjrr;
RUN;

*Bacterial STI*;

PROC RLOGIST data=work.amiscombined design=srs;
CLASS _bacsti;
REFLEV _bacsti = 0;
MODEL _PREPWILL = _bacsti;
PREDMARG _bacsti (0) / adjrr;
RUN;

*PrEP Score*;

PROC RLOGIST data=work.amiscombined design=srs;
CLASS prep_score_high;
REFLEV prep_score_high = 0;

```

```

MODEL _PREPWILL = prep_score_high;
PREDMARG prep_score_high (0) / adjrr;
RUN;

*Receptive anal intercourse last sex*;

PROC RLOGIST data=work.amiscombined design=srs;
CLASS _raslastsex;
REFLEV _raslastsex = 0;
MODEL _PREPWILL = _raslastsex;
PREDMARG _raslastsex (0) / adjrr;
RUN;

*UAS among those who had last sex RAI (REF RECEPTIVE WITH
CONDOMS);
PROC RLOGIST data=work.amiscombined design=srs;
CLASS _uasr;
REFLEV _uasr = 0;
MODEL _prepwill = _uasr;
PREDMARG _uasr (0) / adjrr;
RUN;

*UAS among those who had last sex RAI (REF RECEPTIVE WITHOUT
CONDOMS)*;
PROC RLOGIST data=work.amiscombined design=srs;
CLASS _uasr;
REFLEV _uasr = 1;
MODEL _prepwill = _uasr;
PREDMARG _uasr (2) / adjrr;
RUN;

*UAS among those who had last sex RAI (REF NO RECEPTIVE SEX)*;
PROC RLOGIST data=work.amiscombined design=srs;
CLASS _uasr;
REFLEV _uasr = 2;
MODEL _prepwill = _uasr;
PREDMARG _uasr (2) / adjrr;
RUN;

*Meth*;
PROC RLOGIST data=work.amiscombined design=srs;
CLASS _meth;
REFLEV _meth = 0;
MODEL _PREPWILL = _meth;
PREDMARG _meth (0) / adjrr;
RUN;

*Injection Drug Use*;
PROC RLOGIST data=work.amiscombined design=srs;
CLASS _IDU;
REFLEV _IDU = 0;
MODEL _PREPWILL = _IDU;
PREDMARG _IDU (0) / adjrr;
RUN;

```

```

*Insertive anal intercourse last sex;
PROC RLOGIST data=work.amiscombined design=srs;
  CLASS _iaslastsex;
  REFLEV _iaslastsex = 0;
  MODEL _PREPWILL = _iaslastsex;
  PREDMARG _iaslastsex (0) / adjrr;
RUN;

```

```

*Prep Eligibility*;

```

```

PROC RLOGIST data=work.amiscombined design=srs;
  CLASS prep_eligible;
  REFLEV prep_eligible = 0;
  MODEL _prepwill = prep_eligible;
  PREDMARG prep_eligible(0) / adjrr;
RUN;

```

```

*****
Model Selection and Goodness of Fit: _PREPWILL
*****;

```

```

*Backwards 5%;

```

```

PROC LOGISTIC data=work.amiscombined descending;
  CLASS _age hhincom site_type _partners;
  MODEL _prepwill = _age hhincom site_type
  _lasthivtest12 _bacsti _partners _discord _raslastsex
  prep_eligible/
  SELECTION = backward SLSTAY =.05
  DETAILS
  LACKFIT;
RUN;

```

```

*Backwards 5% using new receptive anal intercourse variable;

```

```

PROC LOGISTIC data=work.amiscombined descending;
  CLASS _age hhincom site_type _partners _uasr;
  MODEL _prepwill = _age hhincom site_type
  _lasthivtest12 _bacsti _partners _discord _uasr prep_eligible/
  SELECTION = backward SLSTAY =.05
  DETAILS
  LACKFIT;
RUN;

```

```
*****Final model for year selected by both stepwise and backwards
includes at 5% significance level: _lasthivtest12 _bacsti
_partners _discord _raslastsex ;
```

```
***HL GOF test non significnat so no evidence of poor fit,
improves with inclusion of site_type***;
```

```
*****
*****
SUDAAN - Predicted Margins ADJUSTED Prevalence Ratios : _PREPWILL
*****
*****;
```

```
options ls=132;
```

```
*HIVTEST*;
```

```
PROC RLOGIST data=work.amiscombined design=srs;
  CLASS _lasthivtest12 _partners;
  REFLEV _lasthivtest12 = 0;
  MODEL _PREPWILL = _lasthivtest12 _bacsti _partners _discord
  _raslastsex;
  PREDMARG _lasthivtest12 (0) / adjrr;
RUN;
```

```
*Number of sex partners*;
```

```
PROC RLOGIST data=work.amiscombined design=srs;
  CLASS _partners;
  REFLEV _partners = 1;
  MODEL _PREPWILL = _partners _lasthivtest12 _bacsti
  _discord _raslastsex;
  PREDMARG _partners (1) / adjrr;
RUN;
```

```
*Discordant Partner*;
```

```
PROC RLOGIST data=work.amiscombined design=srs;
  CLASS _discord _partners;
  REFLEV _discord = 0;
  MODEL _PREPWILL = _discord _partners _lasthivtest12 _bacsti
  _raslastsex;
  PREDMARG _discord (0) / adjrr;
RUN;
```

```
*Bacterial STI*;
```

```
PROC RLOGIST data=work.amiscombined design=srs;
  CLASS _bacsti _partners;
  REFLEV _bacsti = 0;
```

```

MODEL _PREPWILL = _bacsti _discord _partners _lasthivtest12
_raslastsex;
PREDMARG _bacsti (0) / adjrr;
RUN;

```

Receptive anal intercourse last sex;

```

PROC RLOGIST data=work.amiscombined design=srs;
CLASS _raslastsex _partners;
REFLEV _raslastsex = 0;
MODEL _PREPWILL = _raslastsex _bacsti _discord _partners
_lasthivtest12;
PREDMARG _raslastsex (0) / adjrr;
RUN;

```

Receptive anal intercourse last sex with new coding;

```

PROC RLOGIST data=work.amiscombined design=srs;
CLASS _uasr _partners;
REFLEV _uasr = 0;
MODEL _PREPWILL = _uasr _bacsti _discord _partners
_lasthivtest12;
PREDMARG _uasr (0) / adjrr;
RUN;

```

```

*****PREP
USE*****

```

```

*****
*****
SUDAAN - Predicted Margins CRUDE Prevalence Ratios : _PREPUSE
*****
*****;

```

```
options ls=132;
```

Age;

```

PROC RLOGIST data=work.amiscombined design=srs;
CLASS _age;
REFLEV _age = 4;
MODEL _PREPUSE = _age;
PREDMARG _age(4) / adjrr;
RUN;

```

Year;

```

PROC RLOGIST data=work.amiscombined design=srs;
CLASS year;
REFLEV year = 2013;
MODEL _PREPUSE = year;
PREDMARG year(2013) / adjrr;

```

```

RUN;

*Education*;

PROC RLOGIST data=work.amiscombined design=srs;
  CLASS _education;
  REFLEV _education = 1;
  MODEL _PREPuse = _education;
  PREDMARG _education(1) / adjrr;
RUN;

*Insurance Status*;

PROC RLOGIST data=work.amiscombined design=srs;
  CLASS _inscat;
  REFLEV _inscat = 2;
  MODEL _PREPUSE = _inscat;
  PREDMARG _inscat(2) / adjrr;
RUN;

*Census Region*;

PROC RLOGIST data=work.amiscombined design=srs;
  CLASS region;
  REFLEV region = 4;
  MODEL _prepuse = region;
  PREDMARG region(4) / adjrr;
RUN;

*Urbanicity*;

PROC RLOGIST data=work.amiscombined design=srs;
  CLASS rural;
  REFLEV rural = 1;
  MODEL _PREPUSE = rural;
  PREDMARG rural (1) / adjrr;
RUN;

*Income*;

PROC RLOGIST data=work.amiscombined design=srs;
  CLASS hhincom;
  REFLEV hhincom = 0;
  MODEL _PREPUSE = hhincom;
  PREDMARG hhincom (0) / adjrr;
RUN;

*Site Type*;

PROC RLOGIST data=work.amiscombined design=srs;
  CLASS site_type;
  REFLEV site_type = 3;
  MODEL _PREPUSE = site_type;
  PREDMARG site_type (3) / adjrr;
RUN;

```

```

*HIVTEST*;

PROC RLOGIST data=work.amiscombined design=srs;
  CLASS _lasthivtest12;
  REFLEV _lasthivtest12 = 0;
  MODEL _PREPUSE = _lasthivtest12;
  PREDMARG _lasthivtest12 (0) / adjrr;
RUN;

*Number of sex partners*;

PROC RLOGIST data=work.amiscombined design=srs;
  CLASS _partners;
  REFLEV _partners = 1;
  MODEL _PREPUSE = _partners;
  PREDMARG _partners (1) / adjrr;
RUN;

*Unprotected Anal INtercourse last 12 months*;

PROC RLOGIST data=work.amiscombined design=srs;
  CLASS _uas;
  REFLEV _uas = 0;
  MODEL _PREPUSE = _uas;
  PREDMARG _uas (0) / adjrr;
RUN;

*Discordant Partner*;

PROC RLOGIST data=work.amiscombined design=srs;
  CLASS _discord;
  REFLEV _discord = 0;
  MODEL _PREPUSE = _discord;
  PREDMARG _discord (0) / adjrr;
RUN;

*Bacterial STI*;

PROC RLOGIST data=work.amiscombined design=srs;
  CLASS _bacsti;
  REFLEV _bacsti = 0;
  MODEL _PREPUSE = _bacsti;
  PREDMARG _bacsti (0) / adjrr;
RUN;

*PrEP Score*;

PROC RLOGIST data=work.amiscombined design=srs;
  CLASS prep_score_high;
  REFLEV prep_score_high = 0;
  MODEL _PREPUSE = prep_score_high;
  PREDMARG prep_score_high (0) / adjrr;
RUN;

```

```

*Receptive anal intercourse last sex*;

PROC RLOGIST data=work.amiscombined design=srs;
  CLASS _raslastsex;
  REFLEV _raslastsex = 0;
  MODEL _PREPUSE = _raslastsex;
  PREDMARG _raslastsex (0) / adjrr;
RUN;

*UAS among those who had last sex RAI*;
PROC RLOGIST data=work.amiscombined design=srs;
  CLASS _uasr;
  REFLEV _uasr = 0;
  MODEL _prepuse = _uasr;
  PREDMARG _uasr (0) / adjrr;
RUN;

*Meth*;
PROC RLOGIST data=work.amiscombined design=srs;
  CLASS _meth;
  REFLEV _meth = 0;
  MODEL _PREPUSE = _meth;
  PREDMARG _meth (0) / adjrr;
RUN;

*Injection Drug Use*;
PROC RLOGIST data=work.amiscombined design=srs;
  CLASS _IDU;
  REFLEV _IDU = 0;
  MODEL _PREPUSE = _IDU;
  PREDMARG _IDU (0) / adjrr;
RUN;

*Insertive anal intercourse last sex;
PROC RLOGIST data=work.amiscombined design=srs;
  CLASS _iaslastsex;
  REFLEV _iaslastsex = 0;
  MODEL _PREPUSE = _iaslastsex;
  PREDMARG _iaslastsex (0) / adjrr;
RUN;

*Prep Eligibility*;
PROC RLOGIST data=work.amiscombined design=srs;
  CLASS prep_eligible;
  REFLEV prep_eligible = 0;
  MODEL _prepuse = prep_eligible;
  PREDMARG prep_eligible(0) / adjrr;
RUN;

```



```

*****
Model Selection and Goodness of Fit: PREPUSE
*****;

*Backwards at p value 5%*;

PROC LOGISTIC data=work.amiscombined;
    CLASS site_type _partners;
    MODEL _prepuse = _year rural site_type _lasthivtest12
    _bacsti _partners _discord _uas _meth _IDU prep_score_high
    prep_eligible/
        SELECTION = backward SLSTAY =.05
        DETAILS
        LACKFIT;

RUN;

****Final model for year selected by backwards at 5% includes:
_year _lasthivtest12 _bacsti _partners _discord *;
****Results of HL test not significant so no evidence of lack of
fit****;

*****
*****
SUDAAN - Predicted Margins ADJUSTED Prevalence Ratios : _PREPUSE
*****
*****;

options ls=132;

*Year*;

PROC RLOGIST data=work.amiscombined design=srs;
    CLASS _year _partners;
    REFLEV _year = 0;
    MODEL _PREPUSE = _year _lasthivtest12 _bacsti _partners
    _discord;
    PREDMARG _year(0) / adjrr;

RUN;

*HIVTEST*;

PROC RLOGIST data=work.amiscombined design=srs;
    CLASS _lasthivtest12 _partners;
    REFLEV _lasthivtest12 = 0;
    MODEL _PREPUSE = _lasthivtest12 _year _bacsti _partners
    _discord;
    PREDMARG _lasthivtest12 (0) / adjrr;

RUN;

*Number of sex partners*;

```

```

PROC RLOGIST data=work.amiscombined design=srs;
    CLASS _partners;
    REFLEV _partners = 1;
    MODEL _PREPUSE = _partners _year _lasthivtest12 _bacsti
_discord;
    PREDMARG _partners (1) / adjrr;
RUN;

*Discordant Partner*;

PROC RLOGIST data=work.amiscombined design=srs;
    CLASS _discord _partners;
    REFLEV _discord = 0;
    MODEL _PREPUSE = _discord _partners _year _lasthivtest12
_bacsti;
    PREDMARG _discord (0) / adjrr;
RUN;

*Bacterial STI*;

PROC RLOGIST data=work.amiscombined design=srs;
    CLASS _bacsti _partners;
    REFLEV _bacsti = 0;
    MODEL _PREPUSE = _bacsti _partners _year _lasthivtest12
_discord;
    PREDMARG _bacsti (0) / adjrr;
RUN;

```