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AN INVESTIGATION OF FACTORS RELATED TO FOREIGN BIRTH, ENGLISH NON-PROFICIENCY, AND LIFETIME HIV TESTING IN US FROM THE NATIONAL SURVEY FOR FAMILY GROWTH 2013-2015

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By

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B.S., Saint Louis University, 2013

Thesis Committee Chair: Kristin Wall, PhD

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 Epidemiology
2019

Abstract

AN INVESTIGATION OF FACTORS RELATED TO FOREIGN BIRTH, ENGLISH NON-PROFICIENCY, AND LIFETIME HIV TESTING IN US FROM THE NATIONAL SURVEY FOR FAMILY GROWTH 2013-2015

By Nidaa Ekram

Background: Despite increased access to HIV testing, lack of testing is still common in the US, particularly among high risk groups. This contributes to the public health burden of HIV since those who do not know they are infected are at increased risk of transmission. This analysis seeks to identify factors that relate to lifetime HIV testing. It pays particular attention to relationships between foreign birth and English proficiency and lifetime HIV testing.

Methods: We performed a cross-sectional study of individuals interviewed for the National Survey for Family Growth (NSFG) from 2013-2015 stratified by sex. The analysis compared demographics, health behaviors, and risk behaviors for HIV of those who had an HIV test during their lifetime and those who have never had an HIV test. Multivariate logistic regression models were created for men and women to determine which variables were associated with self-reported lifetime HIV testing. A descriptive analysis of reasons for never testing for HIV in lifetime was also investigated.

Results: Birth outside the US and non-English proficiency were not significantly related to lifetime HIV testing. Lifetime HIV testing varied significantly ($p<0.0033$) by education, marital status alcoholic intake, sexual history, and talking to a doctor about HIV/AIDS for men. Lifetime HIV testing varied significantly ($p<0.0041$) by education, marital status, pregnancy status, alcoholic intake, sexual history, and talking to a doctor about HIV/AIDS for women. The primary reason for never testing reported by 70.6% of men and 72.2% of women was that "it is unlikely that you (they) have been exposed to HIV."

Conclusions: The findings indicate that there should increased awareness about the importance of HIV testing because many do not perceive themselves at risk. These findings also emphasize the need for more research regarding the relation between foreign births, English non-proficiency, and HIV testing in the US.

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Acknowledgments

I am truly grateful to my advisor, Kristin Wall, for her expertise, guidance, and support throughout the research, data analysis, and writing of this thesis.

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CHAPTER 1: BACKGROUND AND LITERATURE REVIEW

Introduction

HIV is a virus that spreads through bodily fluids and attacks CD4 cells in the immune system [1]. The virus can cause immunosuppression within infected individuals and leads to increased chance of other infections and diseases due to the weakened immune system if the infection progresses into AIDS [1]. According to the Centers for Disease Control and Prevention (CDC), around 40,000 people become infected with HIV every year in the US, with the highest rates in Black and Hispanic men and in men who have sex with men (MSM) [2].

Current CDC guidelines recommend screening for HIV in healthcare settings for all adults and adolescents 13-64 years of age and recommends that MSM and other high risk groups be tested annually [3]. Since the first commercial HIV antibody test was created in 1985, HIV testing has become quicker and significantly more accessible [4, 5]. Due to increased efforts in testing, 87% of the 1.2 million people who currently live with HIV in the US have been diagnosed and are aware of their infection [4]. Routine testing is one of many strategies for HIV testing endorsed by the CDC and others include recruitment through social networks, partner notification, and targeted outreach in community settings [6]. Though HIV testing is recommended for everyone, many people have not been tested in their lifetime. According to a Kaiser Family Foundation Survey, 43% of US adults ages 18-64 reported never testing for HIV in their lifetime [7].

About 1 in 7 people living with HIV are unaware that they carry the virus. This impacts public health because those who have HIV but are undiagnosed account for one-third of HIV transmissions [2, 8]. This stresses the importance of HIV testing in order to

make people aware of their infection and prevent spread of disease. Research has shown that those who find out they are HIV-positive modify their behavior to reduce risk of transmission, preventing spread of the infection in the population [7]. One-third of people learn they are infected with HIV less than a year before being diagnosed with AIDS. HIV testing is also important because earlier detection and treatment reduces risk of health complications in the individual and reduces HIV rates at a community level [9, 10]. Starting HIV medicine early can lower the levels of the virus to undetectable levels or even suppress it and minimizes immune system damage [11], so early diagnosis through testing is important to prevention and treatment.

Demographic factors play a role in HIV testing in the US. Though young people are at increased risk for HIV, they are less likely to be tested compared to their older counterparts [12, 13]. Despite higher chances of acquiring HIV compared to the general US population, Latino immigrants have low HIV testing rates compared to the general population [14, 15]. They are disproportionately impacted by HIV because 23% of all new HIV diagnoses in the US were among Hispanics/Latinos, while they consist of 16% of the US population. Hispanics/Latinos account for 21% of the 1.2 million people living with HIV in the US [15]. From 2012-2016, while the HIV diagnosis rates for African-Americans and white people dropped, the HIV diagnosis rate remained stable for Hispanic people at 16.1 per 100,000 [16]. As of 2010, the CDC stopped testing immigrants and refugees for HIV-infection before arrival in the US [17].

It is essential to address HIV testing within the foreign-born population, which is growing at a high rate. In 2017, nearly 14% of the US population, or 44 million people, were born in a different country and it was the highest proportion of foreign-born people

in the US ever since 1910 [18]. Hispanic and Asian individuals make up the majority of foreign-born individuals within the US [19, 20], so the population of foreign-born individuals intersects with race and ethnicity as well. Within the US, those who are foreign-born and less proficient in English encounter more barriers to healthcare and HIV testing in particular such as increased dissatisfaction with their providers compared to those who are proficient in English, even if they are of the same Hispanic ethnicity [14, 21-23]. Though many immigrants come to the US proficient in English, many do not. In 2016, around 51% of the foreign-born population age 5 and older reported that they spoke English "Very Well" or otherwise proficient in English [24]. There has been little research studying the connection between the exposures of foreign-birth and English proficiency and HIV testing in the US, so there is no established relation.

This analysis seeks to identify factors that relate to lifetime HIV testing in the National Survey for Family Growth (NSFG) 2013-2015 data in the US. It pays particular attention to any relations between foreign birth and English proficiency.

LITERATURE REVIEW

Race/Ethnicity and HIV Testing

It is essential to consider race and ethnicity within HIV testing because African Americans accounted for 43% (16,694) of HIV diagnoses, while they only compose about 13% of the US population. Hispanics/Latinos accounted for 26% (9,908) of HIV diagnoses and 18% of the US population in 2017[25]. African American gay and bisexual men accounted for the largest number of HIV diagnoses (9,807) in 2017,

followed by Hispanic/Latinos (7,436) and then whites (6,982) [25]. In 2017, new HIV diagnosis increased by 12% among gay and bisexual Latino/Hispanic men, while it fell 14% for white gay and bisexual men [25]. This further supports data about HIV diagnosis rates increasing for Hispanic populations while they have been decreasing or stagnant for other groups [25, 26].

Foreign Birth and HIV Testing

Some other research study foreign birth, but tend to focus on HIV infection or diagnosis and not on testing [23, 27-29]. Some of them also limit the sample to certain populations such as one study that compared HIV diagnoses in foreign born Africans and US-born African-Americans [28]. This study found that annual HIV diagnosis rates were falling at a higher rate (-5.5%; 95% CI: -5.9- -5.0%) for African-Americans born in the US compared to a smaller decrease in annual diagnosis rate for foreign born African-Americans (-1.3%, 95%CI: -2.6%, -0.1%) [28]. The study shows the need to investigate differences surrounding HIV rates in immigrants compared to native born US populations and that if foreign birth makes a difference in diagnosis rates is may also make a difference in testing rates.

There is a relationship between race, foreign birth, and HIV diagnosis in the US. According to the National HIV Surveillance System HIV transmission report, among white people, 1,841 of 55,574 HIV diagnoses (3.3%) were found in persons of foreign birth and in blacks, 8,614 of 86,547 diagnoses (10.0%) were born outside of the US. In Hispanics, 17,913 of 42,431 HIV diagnoses (42.2%) were of foreign birth and Asians had

the highest proportion of foreign births because of 1,987 of 3,088 diagnoses (64.3%) from 2007-2010 [29]. The three countries of immigrant birth origin with the highest number of HIV diagnoses were from Mexico (n = 7311), Haiti (n = 2140), and Cuba (n = 988). The study also found evidence that prevalence of risk factors differed between foreign and native born individuals. For example, the percentage of HIV-diagnosed individuals infected through heterosexual contact was 39.4% among persons born outside the US compared to 27.2% for those who were native born [29]. Other studies have also found that risk behaviors differ among foreign-born populations and native born ones. The findings indicate a need to research immigrant health in the context of HIV and risk behaviors specific to their population in the US because many of their behaviors differ.

Some studies have highlighted the increased stigma related to HIV within immigrant communities within the US. A 2003 study in *AIDS Education and Prevention* surveyed 309 African immigrants in Houston, TX from 20 different countries. The data showed that they had high educational aspirations (past high school) (70.9%) and many immigrated due to academic reasons (45.0%), so they valued education and said they were familiar with modes of HIV transmission. However, 36.3% reported never using a condom and the majority of respondents reported low self-perceived risk for contracting HIV (79.5%). Though they were knowledgeable about certain modes of HIV transmission, they lacked awareness about vertical transmission (16.3% of women; 29.9% of men), and had discouraging scores on an HIV stigma perception scale. So there is a higher level of stigma and negative perception regarding HIV among this immigrant population in Houston. It is worth noting that this study occurred in 2003 and many reported perceptions and stigma could have changed within the past decade. Additionally

the sample in this study is solely comprised of African immigrants, which may not reflect the education levels, behaviors, or perceptions of the general foreign-born population in the US [30]. Another study in *AIDS Education and Prevention* surveyed correlates of condom use among 222 adult heterosexual Latino men in rural North Carolina. Only 50% reported using condoms during their last vaginal intercourse. The study verifies that certain immigrant populations in the US have very low rates of HIV prevention behaviors like condom usage. The study also found that those who had more knowledge of HIV transmission were more likely to use condoms (AOR = 4.45; 95% CI = 2.12-9.36) [31] highlighting the needs for increased preventive interventions in these communities. Another qualitative study of HIV-positive Asian immigrants found that they faced cultural barriers in disclosing their HIV status compared to non-Asian HIV-positive men [32]. Another qualitative study found stress and trauma from migration can also pose as barriers to HIV testing and hinder immigrants from testing because they believe knowing their HIV status will increase stress in their life [33]. Cultural stigma surrounding HIV and stress may be a barrier to HIV testing for many immigrants.

A randomized control trial among 139 Spanish-speaking heterosexual immigrant Latino men (60% from Mexico) randomized them to receive either an HIV prevention or cancer prevention intervention. Those randomized to the HIV intervention were more likely to consistently utilize condoms and receive an HIV Test compared to those randomized to the cancer program intervention. Community-based interventions for immigrant Latino men that are built on prevention science and developed in partnership with community members enhance preventive behaviors and may reduce HIV infection

[34]. Interventions to increase HIV testing in communities can lead to behavioral change and decreased risk behaviors.

There should be a focus on HIV infection among immigrants post migration. One study investigated place of HIV infection by studying CD4 counts among the heterosexual, foreign-born population in the United Kingdom. They estimated that 33% with 95% CI [26-39%] of participants acquired HIV while living in the UK and this percentage increased from 24% with 95% CI [16-39%] in 2004 to 46% with 95% CI [31-50%] in 2010 ($p< 0.01$). The estimate of 33% is three times higher than national estimates of HIV acquired in the UK based on clinic reports (11%) ($p< 0.01$) [35].

English Proficiency and HIV Testing

Immigration and English language proficiency are important factors to research in regards to HIV testing due to their strong tie to barriers to healthcare. Additionally, language and health literacy are highly related to improved self-reported health, which impacts immigrant populations in the US [36]. There have only been a couple studies regarding immigration and HIV testing and few studies have focused on the topic of language proficiency and HIV testing, the majority of which have been cross-sectional. A study published in *Health Services Research* conducted a short assessment among English and Spanish speakers in the US in their chosen language investigating health literacy and found that even at the same level of schooling, more participants who primarily spoke Spanish (27%) had lower health literacy scores compared to English speakers (23.8%) [21], so the role of primary language spoken is important in health literacy and will eventually also impact HIV testing outcomes.

A cross-sectional study of Latinos accessing the Baltimore City Health Department Latino Outreach services surveyed their HIV testing history and other relevant behaviors from 2009 to 2010 to measure the impact of an intervention program. The survey sample included both men and women and 96% of the sample of 247 participants was of foreign birth. When assessed, they were mostly accultured to a Hispanic identity and indicated a preference for Spanish. The study estimates found more women (71%) than men (53%) had been previously tested for HIV ($P = 0.004$) [37]. Among both sexes, prior HIV testing was related to both knowledge about methods of transmission and realizing the fact that an HIV-infected person could appear healthy on the outside. In men, both of these factors increased likelihood of testing compared to individuals with incorrect knowledge of methods of HIV transmission and who did not know that a HIV-infected person could appear healthy (AOR 4.4 and 3.5, respectively) [37]. Though there was decreased likelihood of testing in women with incorrect knowledge of HIV transmission (AOR 0.36), understanding that an HIV-infected person can look healthy increased likelihood of testing (AOR 3.2) which is a trend seen in men too. The study showed the importance of culturally-sensitive HIV testing, especially among non-English speaking or less English proficient individuals because the proportion of those who had previously tested for HIV increased from 37% in 2008 to 62% at the time of the study 2009–2010 after the program [37]. Though they did not specifically focus on English proficiency, it was a variable they took into account in their analysis and measurement of acculturation and they found it could change HIV testing behaviors along with other factors.

Another study examined the relation between acculturation (based on language) and Latinos perceived barriers to HIV care. Spanish-speaking Latinos had 54.2% odds of experiencing stigma related concerns to HIV care compared to 35.4% in English-speaking Latinos and 41.0% non-Latino whites [38]. Therefore, along with race and ethnicity, primary language can also influence HIV care outcomes and perhaps it influences testing as well.

CHAPTER II: MANUSCRIPT:

AN INVESTIGATION OF FACTORS RELATED TO FOREIGN BIRTH, ENGLISH NON-PROFICIENCY, AND LIFETIME HIV TESTING IN US FROM THE NATIONAL SURVEY FOR FAMILY GROWTH 2013-2015

Nidaa Ekram

Background: Despite increased access to HIV testing, lack of testing is still common in the US, particularly among high risk groups. This contributes to the public health burden of HIV since those who do not know they are infected are at increased risk of transmission. This analysis seeks to identify factors that relate to lifetime HIV testing. It pays particular attention to relationships between foreign birth and English proficiency and lifetime HIV testing.

Methods: We performed a cross-sectional study of individuals interviewed for the National Survey for Family Growth (NSFG) from 2013-2015 stratified by sex. The analysis compared demographics, health behaviors, and risk behaviors for HIV of those who had an HIV test during their lifetime and those who have never had an HIV test. Multivariate logistic regression models were created for men and women to determine which variables were associated with self-reported lifetime HIV testing. A descriptive analysis of reasons for never testing for HIV in lifetime was also investigated.

Results: Birth outside the US and non-English proficiency were not significantly related to lifetime HIV testing. Lifetime HIV testing varied significantly ($p<0.0033$) by education, marital status alcoholic intake, sexual history, and talking to a doctor about HIV/AIDS for men. Lifetime HIV testing varied significantly ($p<0.0041$) by education, marital status, pregnancy status, alcoholic intake, sexual history, and talking to a doctor about HIV/AIDS for women. The primary reason for never testing reported by 70.6% of men and 72.2% of women was that "it is unlikely that you (they) have been exposed to HIV."

Conclusions: The findings indicate that there should increased awareness about the importance of HIV testing because many do not perceive themselves at risk. These findings also emphasize the need for more research regarding the relation between foreign births, English non-proficiency, and HIV testing in the US.

Introduction

The Centers for Disease Control and Prevention (CDC) estimates 40,000 people become infected with HIV annually in the US, with the highest rates in Black and Hispanic men and men who have sex with men (MSM) [2]. Of the individuals living with HIV in the US at the end of 2015, the CDC estimated that 1 out of 7 were unaware of their infection [25]. Undiagnosed HIV infection impacts public health because those who are undiagnosed account for one-third of HIV transmissions. This stresses the importance of HIV testing in order to make people aware of their infection [2, 8]. Young people are the most likely to be unaware of their HIV status compared to older age groups. Among people aged 13-24 who were living with HIV, an estimated 51% were unaware of their infection [8]. HIV testing is also important because earlier detection and treatment reduces risk of health complications in the individual and reduces HIV incidence [9, 10]. Starting HIV medicine early can lower viral load to undetectable levels [11].

CDC guidelines from 2018 recommend annual screening for HIV in healthcare settings for all persons 13-64 years of age [3]. As of 2010, the CDC stopped the regular practice of testing refugees for HIV-infection before arrival into the US [17]. Before 2010, US immigration laws prohibited HIV-infected individuals from coming into the country. These statutory and regulatory bans were removed after 2010, and as of January 4, 2010, HIV no longer disqualified entry into the US for either visitation or immigration [39]. Legally, HIV status on its own cannot cause exclusion, removal, or deportation from the US [39].

Many interventions centered on HIV prevention focus on specific high-risk groups or groups that have higher rates of HIV diagnosis, such as African-Americans,

MSM and Hispanic people in the US [2]. Despite higher chances of acquiring HIV compared to the general US population, Latino immigrants have low HIV testing rates compared to the general population in the US [14]. In a 2011 national survey conducted by the Kaiser Family Foundation, 44% of Hispanic/Latino respondents reported never being tested for HIV [40]. Also within the US, those who are foreign-born and less proficient in English encounter more barriers to healthcare and HIV testing in particular such as higher dissatisfaction with their providers compared to those who are proficient in English, even if they are of the same Hispanic ethnicity [14, 21-23]. From 2012-2016, while the HIV diagnosis rates for African-Americans and white people dropped, the HIV diagnosis rate remained stable for Hispanic people at 16.1 per 100,000 [41]. Additionally, in the Western US, Hispanic people account for 40% of HIV diagnoses, but only comprise 29% of the population [19, 41]. A study of 127 HIV-infected Latinos in the US found those who immigrated were more likely to present with advanced HIV compared to US-born counterparts, emphasizing the importance of earlier testing in the immigrant Latino population [42].

Immigration and English language proficiency are important factors to research in regards to HIV testing due to their strong tie to barriers to healthcare. There is a research gap regarding immigration and HIV testing and fewer studies have focused on the topic of language proficiency and HIV testing. Many studies investigating immigration and HIV tend to focus on HIV infection or diagnosis and not on testing [27, 43, 44]. Some studies limit the sample to certain populations such as one study that compared HIV diagnoses in foreign born and US-born African-Americans. This study found that annual HIV diagnosis rates were decreasing at a rate of 5.5% [95% CI -5.9%, -5.0%] for

African-Americans born in the US compared to a smaller decrease in annual diagnosis rate for foreign born African-Americans [1.3%, 95% CI -2.6%, -0.1%] [28]. The study shows the need to investigate differences surrounding HIV rates in immigrants compared to native-born US populations. Testing rates may also differ between foreign and native born populations, but there is a research gap in the subject area. A 2017 qualitative study of 34 Latino immigrants in New York City investigated migration and HIV testing behaviors. Their interviews showed cumulative stress and trauma from migration processes often led to avoidance of stressful activities such as HIV testing [33].

Language barrier to HIV testing is another research gap. Investigators conducted a short assessment among English and Spanish speakers in the US in their chosen language investigating health literacy and found that even at the same level of schooling, more participants who primarily spoke Spanish (27%) had lower health literacy scores compared to English speakers (23.8%) [21], so the role of primary language spoken is important in health literacy and has the potential to impact HIV testing outcomes, especially in populations more vulnerable to language barriers like immigrants in the US. There is a need to investigate the impact of English proficiency on lifetime HIV testing.

To address gaps in the literature, this study explores the role that foreign birth and English literacy plays in odds of ever being tested for HIV. This study is cross-sectional using interview data from the data from the 2013-2015 National Survey for Family Growth (NSFG).

Methods

Study design and the NSFG. This cross-sectional study was conducted from publicly available data from the nationally administered National Survey for Family Growth (NSFG). The NSFG is conducted by the National Center for Health Statistics (NCHS) at the Centers for Disease Control and Prevention (CDC) with additional support from other agencies [45]. In particular, the study focuses on questions and data retrieved from the 2013-2015 cycle of the survey.

The first cycle of the NSFG started in 1973 and periodically surveyed only women to produce reliable national-level data on marriage, divorce, contraception, infertility, and the health of women and infants in the United States. In 2002, the survey expanded during its sixth cycle to include a sample of men [45]. The interviews are administered in eight quarters over the two years and are conducted in person by female interviewers from the University of Michigan Institute for Social Research under contract from the NCHS.

The 2013-2015 public use data files were released in October 2016 and include de-identified data collected from 10,205 survey participants: 5,699 interviews with women and 4,506 with men interviewed between September 2013 and September 2015. The survey gathers information on family life, marriage and divorce, pregnancy, infertility, use of contraception, and men's and women's health in the US. The sample contains nationally representative, non-institutionalized, men and women from 15-49 years old living in households. The sample in the survey is designed to analyze data on a national level, not by individual states. NSFG is conducted through in-person interviews, with a portion of the more sensitive questions answered privately by self-administration

through audio computer-assisted self interview software (ACASI) [46]. Around 5% (512 out of 10,210) of the interviews were conducted in Spanish, which is the only other language accommodated for in the NSFG design [46].

The study population consists of civilian, non-institutionalized individuals in the US spanning from 15 to 44 years old. Racial and ethnic minorities such as African-Americans and respondents of Hispanic ethnicity along with age groups like adolescents (ages 15-19 years old) were oversampled to produce reliable estimates for the data [46]. In the sample design, they also wanted to minimize the overall design effects for the sample population, control the cost of screening and interviewing, and get an overall sample size of at least 5,000 interviews per year [46]. An individual was randomly selected from each household and interviewed for the study. Weighted data was used for national level estimates with methods and procedures adapted by the NCHS [45]. The methods and procedures from the NCHS account for weighting based on selection probability, non-response and sampling differences between regions.

Outcome of interest. The outcome of interest was self-reported lifetime HIV testing ("Ever having been tested for HIV outside of blood donation"). The outcome variable for HIV testing was assessed through a survey question asking "Have you ever been tested for HIV, outside of blood donation?" which was also coded with a "Yes" or "No" response option. If they answered "Not Ascertained," "Refused," or "Don't Know", then the variable was coded as missing for this analysis and excluded.

Exposures of interest. Birth outside the US and English proficiency levels were of primary interest, and were included in models *a priori*. Survey questions for these variables were "Whether Respondent was born outside the US" and "How well does

Respondent Speak English." The variable for birth outside the US was coded as "Yes" or "No." The variable to assess English proficiency, which was captured in four categories in the survey, was coded dichotomously for this analysis as speaking English "Very Well/Well" and "Not Very Well/Well."

Demographic and risk behavior variables were also investigated as exposures. These included respondent self-reported age, health insurance coverage, education, marital status, race and ethnicity, poverty level, pregnancy, sexual orientation, and protective and risk behaviors for HIV. Protective and risk factor variables asked about: current opposite sex partners, alcoholic intake, injection drug use and sharing needles, sex with injection drug users or HIV positive individuals, sexual history, number of male sex partners, monogamy, exchanging money or drugs for sex, condom use, sex education, STD treatment, and talking with a doctor about HIV/AIDS.

Analysis. Respondents who lacked information on the outcome of "Ever having been tested for HIV outside of blood donation" were excluded from the study. In the sample, 39 out of 4,506 men and 45 out of 5,699 women were excluded due to lack of information on lifetime HIV testing. Statistical analysis was conducted using Statistical Analysis Software (SAS, version 9.4). Since the NSFG incorporated a complex survey design, that was accounted for in the analysis using PROC SURVEY procedures. Weight (WGT2013_2015), sampling stratum (SEST), and cluster (SECU) variables were used in analyses to account for sampling errors and represent a national sample accurately. Descriptive statistics were used to describe the exposures of interest, stratified by the outcome of interest. Chi-squared tests were used to assess the relationships between

HIV testing and categorical variables, while Mann-Whitney U tests were used to assess relationships between HIV testing and continuous variables.

Logistic regression models were used to evaluate the association between exposures and outcome of interest. Crude and adjusted prevalence odds ratios and 95%CIs were obtained. Since multiple comparisons were made, Bonferroni adjusted p-values guided model variable selection (Bonferroni adjusted p=0.0033 for men and p=0.0041 for women). Variables significantly related to the outcome in bivariate analyses (applying the Bonferroni adjusted p-values) were considered for inclusion into the final models. Multi-collinearity was explored using standard conditional index and variance decomposition proportion cutoffs. Models were built separately for men and women. Age and race were included in the models *a priori* due to previous research relating HIV testing to age and race[2, 25].

For respondents who reported never having received an HIV test, their self-reported main reasons for not having tested (captured using the survey question "Respondents main reason for never having an HIV test,", which was collected as a closed-ended question in which the respondent could only select one answer), are described.

Ethics. Emory IRB approval was not needed because the study was a secondary analysis of de-identified data.

Results

The distribution of all variables stratified by the outcome is presented in Table 1A for men and Table 1B for women. The distribution of foreign-born participants was

similar in both men and women; 17.9% of men and 17.3% of women had been born outside the US. The distribution was also similar between men and women for English proficiency; 5.5% of men and 5.4% of women responded “Not Very Well” or “Not Well” proficient in English (Table 1A, Table 1B). Among men, 45.5% were tested for HIV in their lifetime and among women, 61.0% were tested for HIV in their lifetime (p=<0.001).

In both men and women, slightly more people who had been tested for HIV were born outside the US. Among men who had been tested for HIV, 18.5% were born outside the US, while among men who had never been tested for HIV, 16.9% were born outside the US. However the relationship was not found to be significant (p=0.364). Among women who had been tested for HIV, 18.1% were born outside the US, while among women who had never been tested for HIV, 16.1% were born outside the US. However the relationship was not found to be significant (p=0.286).

Men born outside the US had 12% higher odds of never having been tested for HIV compared to those born in the US. However, the value was not found to be statistically significant (95% CI: 0.87 – 1.44) in the unadjusted models (Table 1A). The same association was found in women born outside the US who had 16% higher odds of never having been tested for HIV compared to those born in the US (95% CI: 0.88 – 1.51) in the unadjusted models (Table 1B). Men who were “Not Very Well/Not Well” proficient in English had 27% lower odds of having ever been tested for HIV compared to men who reported “Very Well/Well” English levels (95% CI: 0.51 – 1.06) (Table 1A). A different relationship was found for women, but neither of the associations was statistically significant. Women who were “Not Very Well/Not Well” proficient in

English had 47% increased odds of ever having been tested for HIV compared to men who reported "Very Well/Well" English levels (95% CI: 0.98 – 2.20) (Table 1B).

In the unadjusted models, men who belonged to the age group in the 1st Quartile (15-21 years old) had 87% lower odds of being tested for HIV compared to men in the 4th Quartile (36 years or older) (95% CI: 0.10 – 0.18) (Table 1A). The unadjusted odds were similar in women who belonged to the age group in the 1st Quartile (15-21 years old) had 88% decreased odds to be tested for HIV compared to women in the 4th Quartile (36 years or older) (95% CI: 0.09 – 0.16) (Table 1B). Those with a high school education or GED had 2.29 times (95% CI: 1.81 – 2.91) and 2.65 times (95% CI: 2.12 – 3.32) the odds to be tested for HIV in men and women respectively compared to those with less than a high school education in unadjusted models (Table 1A, Table 1B). Non-Hispanic Blacks had higher odds of HIV testing in both men and women compared to Non-Hispanic Whites in the unadjusted models. Non-Hispanic Black men had 2.70 times (95% CI: 1.94 – 3.76) the odds to be tested for HIV and Non-Hispanic Black women had 2.68 times (95% CI: 2.12 – 3.39) the odds to be tested for HIV when both men and women were compared to Non-Hispanic Whites (Table 1A, Table 1B).

Testing history varied significantly ($p<0.0033$) by education, marital status, alcoholic intake, sexual history, and talking to a doctor about HIV/AIDS for men excluding variables that were highly collinear or correlated. Two of the variables ("Ever had Sex" and "Number of Opposite-Sex sex partners in Lifetime") were highly correlated and the lifetime partner variable was excluded from the model. After running the collinearity assessment, the variable for "Ever been tested for STD" was removed from the model due to its collinearity with "Ever had Sex." In the adjusted model for males,

those in the first age quartile aged 15-21 years (0.14; 95% CI: 0.10 – 0.19) or the second age quartile aged 22-28 years (0.50; 95% CI: 0.36 – 0.64) were still at decreased odds to have tested for HIV compared to the 36 or over age group. In the adjusted model for males, those with a high school education (1.35; 95% CI: 1.04 – 1.75) or those with more than 4 years of college (1.99; 95% CI: 1.23 – 3.22), Non-Hispanic Blacks (3.39; 95% CI: 2.33 – 4.94), those who drink alcohol several times a year (1.73; 95% CI: 1.24 – 2.41) or once a month (1.72; 95% CI: 1.13 – 2.63) or once a week (1.78; 95% CI: 1.31 – 2.42) or once a day (1.60; 95% CI: 1.08 – 2.36), those who have had sexual intercourse (3.07; 95% CI: 2.09 – 4.51), and those who have a conversation with their doctor about HIV/AIDS (4.05; 95% CI: 3.16 – 5.19) were still at higher odds to have tested for HIV in their lifetime compared to those with less than a high school education, Non-Hispanic Whites, who never drank alcohol, who have not had sexual intercourse, and who have never talked with their doctor about HIV/AIDS, respectively (Table 2A).

Testing history varied significantly ($p<0.0041$) by education, marital status, pregnancy status, alcoholic intake, sexual history, talking to a doctor about HIV/AIDS for women. Two of the variables ("Ever had Sex" and "Number of Opposite-Sex sex partners in Lifetime") were highly correlated and the lifetime partner variable was excluded from the model. After running the collinearity assessment, the variable for "Ever been tested for STD" was removed model due to its collinearity with "Ever had Sex." In the adjusted model for females, those in the first age quartile aged 15-21 years (0.29; 95% CI: 0.20 - 0.42) and those who were married (0.61; 95% CI: 0.47 - 0.80) were still at decreased odds to have tested for HIV in their lifetime compared to the 36 or over age group and those who were not married. In the adjusted model for females, those who

were pregnant (4.36; 95% CI: 3.27 – 5.80), Hispanic (1.36; 95% CI: 1.01 – 1.82) or Non-Hispanic Blacks (3.42; 95% CI: 2.45 – 4.77), those who drink alcohol several times a year (1.55; 95% CI: 1.14 – 2.09) or once a month (1.49; 95% CI: 1.06 – 2.11) or once a week (1.88; 95% CI: 1.30 – 2.72) or once a day (2.20; 95% CI: 1.41 – 3.43), those who have had sexual intercourse (7.64; 95% CI: 5.33 – 10.94), and those who have a conversation with their doctor about HIV/AIDS (2.59; 95% CI: 2.10 – 3.19) were at higher odds of having been tested for HIV in their lifetime compared to those who had never been pregnant, Non-Hispanic Whites, those who never drank alcohol, who have not had sexual intercourse, and who have never talked with their doctor about HIV/AIDS (Table 2B).

In men and women the main reasons for never testing for HIV, outside of blood donation, were the same. The primary reason for never testing reported by 70.6% of men and 72.2% of women was that "it is unlikely that you (they) have been exposed to HIV." The second most reported reason for never testing in 21.2% of men and 21.6% of women was that "you (they) have never been offered an HIV test." Other responses on reasons for never testing that were less frequent included "Some other reason," with 3.4% in men and 1.9% in women and "You (they) do not like needles," with 3.0% in men and 2.2% in women (Table 3).

Discussion

It was originally hypothesized that birth outside the US and lower self-reported English proficiency levels would be related to lower prevalence of lifetime HIV testing. Results show that they were not related to HIV testing in either men or women. Though

Hispanic ethnicity and foreign birth were not significantly related to HIV testing status compared with native born or Non-Hispanic White individuals, other research on this topic has found mixed results. While some studies suggest that Hispanic individuals and those of foreign birth have higher chances of never testing for HIV and lower levels of HIV knowledge compared to non-Hispanic native born populations [47, 48], some find other relations. One study of 2006-2010 NSFG data found proportions for lifetime HIV testing were similar among Hispanics and Non-Hispanic Whites, so no relation was found between ethnicity and HIV testing [49]. In this analysis, English proficiency was also insignificantly related to HIV testing, but similar studies on acculturation (measured based on language) and HIV suggest that Spanish language was significantly related to stigma-related concerns impacting HIV status [38]. Since the question used to assess the outcome asks "Has Respondent ever been tested for HIV outside of blood donation," the time of testing is unknown. If someone had immigrated to the US prior to 2010, they could have been tested in during the course of the immigration process because it was part of the CDC medical examination, since immigrants are likely to be less proficient in English [24], the medical examination could also explain why the lower English proficiency was insignificantly related to HIV testing.

In men and women, the two youngest age group quartiles (encompassing 15-28 year olds) had lower odds of ever testing for HIV compared to the oldest age group of 36+ years old in fully adjusted models, logically those who have lived longer have higher odds of ever testing for HIV. This concurs with previous research about low levels of HIV testing among younger age groups across both sexes [12, 13]. The relationship between HIV testing and age was not significant among the 3rd quartile (29-35 year olds)

compared to the 36+ year olds, suggesting HIV testing behaviors stay the same around 29 years and older. It was interesting that in the adjusted models for males, education was a significant predictor for certain education levels, like high school and more than 4 years of college, when compared with those who had less than a high school education. Previous research also found significant association with lower levels and education and lower odds of HIV testing among men [48]. Meanwhile education was not significant at any level for women in the adjusted model. Maybe men who have less than a high school education have lower health literacy and likely utilize preventive health services less or have less access than more educated men. Health literacy and access to testing services particularly among those who are less educated should be improved.

In fully adjusted models, being married lowered odds of HIV testing among women, but not men. Perhaps married women have a low risk perception of HIV, and do not get tested because of it. Also, previous research indicates heterosexual married individuals engage in fewer risk behaviors for HIV and have lower odds of testing for HIV [50]. There should be increased coverage of HIV testing services among heterosexual married couples in the US. Significant relationships with HIV testing and having sex and or having been pregnant were logical because sexually-active individuals get tested for HIV more compared to non-sexually active due to the nature of the transmission and most prenatal care involves getting tested for HIV as well.

In fully adjusted models, the only significant relation ($p<0.001$) between race, ethnicity and HIV testing was found among Non-Hispanic Blacks in both men and women and among Hispanic women who were at higher odds of lifetime testing. Non-Hispanic Blacks are a high risk group for HIV, so they are likely targeted for HIV testing

interventions. It supports previous research regarding Non-Hispanic Blacks having higher odds of lifetime HIV testing [51]. Though they have higher odds of lifetime testing, the same study found lower odds of annual HIV testing among Non-Hispanic Blacks [51] and increased stigma against HIV testing in the population of Black immigrants [30, 52]. Perhaps Hispanic women were tested due to pregnancy. It is recommended to continue testing high risk groups for HIV and also have cultural interventions to decrease stigma around HIV among the population of Black immigrants.

In fully adjusted models for both men and women, drinking alcohol "Several Times during the Year" or more frequently had higher odds of lifetime HIV testing. Alcohol use may be related to high risk behaviors, like multiple sexual partners or decreased condom use, which increases awareness of HIV testing among individuals who drink more frequently, and thereby increases odds of testing. Though there have not been many studies on alcohol use and HIV testing in the US, a previous study has found that those with more alcohol intake have higher odds of engaging in risky sexual behavior, especially in youth [53]. HIV testing interventions should continue to be implemented within high risk behavior populations, like those who drink alcohol more frequently.

Talking to a doctor about HIV/AIDS was significantly related to HIV testing for both men and women. Another study found that patients were more likely to accept HIV testing if their physicians recommended it, so physicians talking with the patients about HIV and recommending testing are beneficial [54]. This highlights the importance and need for access to health insurance and communication with medical professionals about topics relating to HIV.

According to a study of NSFG data, receipt of a sexual risk assessment was observed in those with two or greater opposite-sex partners in the past year and for men who had a male sexual partner or any HIV risk-related sexual behaviors in the past year [55]. Sexual risk assessments are when healthcare providers ask patients about recent behaviors related to HIV/STI and the assessments were higher among high risk groups who reported participating in HIV-related risk behaviors within the past year.

According to this study, the most common reason for never testing for HIV was that "It is unlikely that you've (the respondent) ever been exposed." After that, the next most common reason for never getting an HIV test was "You (the respondent) have never been offered an HIV test," These results parallel previous research using 2011-2015 NSFG data on reasons for not HIV testing[56] and they also parallel other research about HIV risk perceptions and individuals and certain subpopulations not perceiving themselves as at-risk [30, 38, 57, 58]. Reasons for never testing differ among different subpopulations because in a prior study, high risk groups, such as MSM, have stated that denial of risk factors and fear of finding out HIV status are other reasons for not testing. Increased cultural stigma is another common reported reason as a barrier to HIV testing and treatment, especially in minority populations like immigrants and African-Americans [12, 32, 38, 59]. Providers should be trained to assess HIV risk and regularly offer testing. Additionally, since stigma play a large role in avoidance of HIV testing, having cultural intervention to address perceptions would be beneficial.

Many studies investigating HIV testing behaviors focus in a particular city or state [37, 60], whereas this study focused on national-level estimates and has more generalizability for the US. There also have not been many studies regarding

immigration and HIV testing and English proficiency and HIV testing within the US, so the study investigates a topic that has not been thoroughly researched previously. A strength of the study is that the analysis was weighted and used cluster sampling, so it could be generalizable to the US population, however certain subpopulations will be excluded and that is discussed below. One strength is that the study investigates a wide variety of variables related to HIV testing, foreign birth, and English Proficiency.

Because the study is cross-sectional there may be concern over temporality for some variables and no causal associations can be inferred. Though foreign birth predates HIV testing and establishes temporality, English proficiency can change and is not guaranteed to come prior to HIV testing. Additionally, HIV testing could have occurred prior to coming to the US. Therefore temporality is not ensured for English proficiency and HIV testing, but in the majority of cases people have their English proficiency level prior to being tested for HIV unlike cases of respondents in the process of learning English. Because the NSFG survey design primarily accounts for English and Spanish speakers, those who speak languages other than English or Spanish may have encountered more language barriers. This decreases generalizability of the study to exclude those who do not speak English or Spanish and introduces potential bias. However, the vast majority of the US population does speak either English or Spanish, so including other language speakers would not have severely influenced results. Because the NSFG surveyed from households, it leaves out individuals who are homeless or institutionalized and this also decreases generalizability and could introduce potential bias. NSFG also relies on self-report, so there could be recall and social desirability bias particularly when asking about stigmatized topics related to HIV, sexual behaviors, and

drugs and alcohol, which could explain why some of the risk behaviors usually related to HIV, were not significant in this analysis.

Since this study only focused on surveying households within the US, it may be missing data on undocumented immigrants, who could refuse to participate. One study of 300 immigrants in New York found that undocumented and documented immigrants had similar HIV testing behaviors within the past 12 months, and similar perceptions and fear around HIV testing. However, undocumented immigrants reported lower rates of HIV testing in their lifetime (68.6%) compared to documented immigrants (80.5%) ($p = 0.027$) [58]. Due to the changing political climate, in future studies, it would be interesting to include undocumented immigrants on a multi-city or national level and investigate their HIV testing beliefs and behaviors compared to documented immigrants. Future studies can also focus on English proficiency and have participants take a formal assessment of their English proficiency level instead of relying on self-reported measures.

Conclusions

Findings from the study indicate that foreign birth and English proficiency are not significantly related to lifetime HIV testing. However the findings did indicate certain variables like younger age, lower education in males, marriage in females, and not talking with a doctor about HIV/AIDS were related to never testing for HIV in one's lifetime. Additionally many individuals in the sample did not perceive themselves as risk for HIV, which was the most common reason for never testing for HIV.

Though foreign birth and English proficiency were insignificantly related to HIV testing, it is still important to study HIV testing outcomes in individuals who arrived after 2010

now that HIV status is not a barrier to migration into the US [39], so that could be topic of future study. Additionally the factors behind the association should still be investigated. For future studies, it would be beneficial to study when the HIV test occurred as opposed to asking if the respondent had ever been tested for HIV. Though in this study, the exposure of interest were not found to be significantly related to HIV testing, the changing landscape of immigrants in the US and the growing Hispanic population indicate a need to increase HIV testing outcomes within this particular subpopulation.

CHAPTER III: SUMMARY, PUBLIC HEALTH IMPLICATIONS AND POSSIBLE FUTURE DIRECTIONS

Summary

Being born outside the US and non-English proficiency were not significantly related to lifetime HIV testing in the sample. Lifetime HIV testing varied significantly ($p<0.0033$) by education, marital status alcoholic intake, sexual history, and talking to a doctor about HIV/AIDS for men. Lifetime HIV testing varied significantly ($p<0.0041$) by education, marital status, pregnancy status, alcoholic intake, sexual history, and talking to a doctor about HIV/AIDS for women. The primary reason for never testing reported by 70.6% of men and 72.2% of women was that "it is unlikely that you (they) have been exposed to HIV."

Public Health Implications

Not self-reporting any lifetime HIV testing was significantly related to certain variables, such as younger age groups and those with lower education levels. Infected individuals who do not know they are infected may put themselves at risk for more health complications and also put their networks and communities at risk HIV infection. Therefore, testing is important for treatment and prevention of disease.

In addition to the public health concerns, there is also an economic reason to increasing HIV testing in the US population. The CDC estimates that lifetime treatment cost of an HIV infection is estimated to be $379,668 (in 2010 dollars), which is much

more costly than testing [61]. Furthermore, the prevention of HIV and HIV transmission could save hundreds of millions of dollars in direct and indirect medical costs.

Possible Future Directions

This analysis revealed that prevalence of HIV testing is low in the general US population, particularly among certain groups such as younger individuals. Though it is important to pay attention to high risk groups in HIV testing interventions and test them more frequently, it is also important to promote lifetime HIV testing among individuals that may not perceive themselves at risk for infection. Decreasing stigma involved with HIV and testing by discussing it with medical providers and increasing counseling efforts could also improve odds of testing. Increasing HIV testing among the population would be beneficial in reliving the public health burden of HIV. It would decrease HIV transmission and spread, along with lowering individual health complications of HIV by detecting infected individuals earlier to be treated.

Since the NSFG likely did not interview undocumented immigrants, it would be interesting for future research to study HIV testing among undocumented immigrants. Frequency of HIV testing would also be interesting to study because although someone may have been tested once in their life, it does not necessarily mean that they regularly receive HIV testing. Considering there is not much research on immigration and HIV testing, and on English proficiency and HIV testing and the relation was not found to be significant in this analysis, it may be important to investigate the relation between them further. The relationship is especially important to examine as policies, such as screening for HIV at entry into the US for immigrants and refugees, change.

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APPENDIX

TABLE 1A: Weighted estimates of selected characteristics of Male Respondents aged 15-44 years: National Survey of Family Growth, 2013-2015

	LIFETIME HIV TEST (in thousands)		NO LIFETIME HIV TEST(in thousands)		p-value**	cPOR	95% CI		p-value
	N	%	N	%					
Born Outside US					0.358				
Yes	5,101	18.5	5,556	16.9		1.12	0.87	1.44	0.364
No	22,417	81.5	27,386	83.1		ref			
English Proficiency					0.094				
Very Well/Well	26,046	95.4	30,764	93.8		ref			
Not Very Well/Not Well	1,264	4.6	2,034	6.2		0.73	0.51	1.06	0.098
Age Group					<0.001				
1st Quartile (15-21 years old)	2,185	7.9	12,002	36.4		0.13	0.10	0.18	<0.001
2nd Quartile (22-28 years old)	6,787	24.7	7,920	24.0		0.63	0.50	0.79	<0.001
3rd Quartile (29-35 years old)	8,747	31.8	5,887	17.9		1.08	0.84	1.40	0.533
4th Quartile (36+)	9,799	35.6	7,142	21.7		ref			
Whether Respondent lacked healthcare coverage in last 12 months					0.001				
Yes	8,909	32.4	8,117	24.6		1.46	1.17	1.82	0.001
No	18,523	67.3	24,585	74.6		ref			
Don’t Know	87	0.3	243	0.7		0.47	0.12	1.86	0.279
Education					<0.001				
Less than High School	4,020	14.6	9,774	29.7		ref			

High School (12th grade/GED)	7,866	28.6	8,338	25.3		2.29	1.81	2.91	<0.001
Some College (no degree)	5,781	21.0	7,031	21.3		2.00	1.60	2.50	<0.001
College (Associates/Bachelors degree)	6,863	24.9	6,326	19.2		2.64	2.00	3.48	<0.001
More than 4 years College	2,988	10.9	1,482	4.5		4.90	3.12	7.69	<0.001
Ever Married					<0.001				
Yes	14,568	52.9	11,993	36.4		1.97	1.66	2.33	<0.001
No	12,950	47.1	20,958	63.6		ref			
Race and Hispanic Origin					<0.001				
Hispanic	5,633	20.5	7,304	22.2		1.04	0.82	1.32	0.734
Non-Hispanic White	14,535	0.5	19,623	59.6		ref			
Non-Hispanic Black	4,925	17.9	2,459	7.5		2.70	1.94	3.76	<0.001
Non-Hispanic Other or Multiracial	2,425	8.8	3,566	10.8		0.92	0.68	1.23	0.563
Sexual Orientation					<0.001				
Heterosexual or Straight	25,905	95.3	31,547	96.6		ref			
Homosexual or gay	725	2.7	288	0.9		3.07	1.70	5.53	<0.001
Bisexual	471	1.7	691	2.1		0.83	0.54	1.28	0.393
DK	77	0.3	140	0.4		0.67	0.22	2.05	0.477
Poverty Level					0.029				
Below or At Poverty Level	6,615	24.0	9,447	28.7		0.79	0.63	0.98	0.034
Above Poverty Level	20,903	76.0	23,504	71.3		ref			
Number of Current Non-Marital/Non-cohabiting Opposite-Sex Partners					0.376				
1 Partner	5,372	92.3	5,032	94.3		ref			

2 Partners	397	6.8	251	4.7		1.48	0.83	2.65	0.179
3 Partners	51	0.9	51	1.0		0.95	0.25	3.62	0.939
Last 12 Months How Often Drink Alcoholic Beverages					<0.001				
Never	3,224	0.1	8,561	0.3		ref			
Once or Twice during Year	3,513	12.9	5,080	15.5		1.84	1.36	2.48	<0.001
Several Times during Year	4,090	15.0	4,234	12.9		2.57	1.87	3.51	<0.001
About once a month	4,102	15.0	4,081	12.5		2.67	1.92	3.71	<0.001
About once a week	9,559	35.0	8,241	25.1		3.08	2.37	4.01	<0.001
About once a day	2,793	10.2	2,570	7.8		2.89	2.13	3.91	<0.001
Applicable if Respondent did not report ever injecting drugs w/o prescription: Ever in Life Shared IV Needle?					0.015				
Yes	565	53.9	109	23.6		3.77	1.21	11.75	0.023
No	484	46.1	354	76.4		ref			
Applicable if Respondent reported any female sexual partners in last 12 months or if he did not know how many female partners he had in last 12 months: Last 12 months Respondent had sex with female IV drug user					0.077				
Yes	575	2.3	254	1.0		2.29	0.87	5.99	0.091

No	24,220	97.7	24,430	99.0		ref			
Has Respondent ever had sex?					<0.001				
Yes	26,659	96.9	25,670	77.9		8.81	6.26	12.39	<0.001
No	859	3.1	7,281	22.1		ref			
Applicable if Respondent reported any female sexual partners in last 12 months or if he did not know how many female partners he had in last 12 months: Has Respondent had sex with HIV-positive female					0.715				
Yes	55	0.2	42	0.2		1.30	0.31	5.50	0.719
No	24,765	99.8	24,647	99.8		ref			
Applicable if Respondent reported a male sex partner in last 12 months or responded DK: Has Respondent had sex with HIV-positive male					0.584				
Yes	129	13.7	42	9.5		1.52	0.32	7.25	0.591
No	809	86.3	402	90.5		ref			
Last 12 months how often Respondent injected non-prescription drugs					0.014				
Never	26,868	99.2	32,658	99.6		ref			
Several Times	157	0.6	23	0.1		8.37	2.3	29.8	0.002

during Year							5	0	
About once a month or more	67	0.2	106	0.3		0.77	0.17	3.47	0.732
Applicable if Respondent reported a male sex partner in last 12 months or responded DK: Last 12 months: Respondent gave money or drugs to male for sex					0.003				
Yes	21	2.3	52	11.6		0.18	0.04	0.74	0.020
No	906	97.7	392	88.4		ref			
Applicable if Respondent reported any female sexual partners in last 12 months or if he did not know how many female partners he had in last 12 months: Last 12 months, Respondent gave money or drugs to female for sex					0.068				
Yes	504	2.0	220	0.9		2.31	0.89	5.95	0.083
No	24,318	98.0	24,469	99.1		ref			
Number of opposite-sex(Female) sex partners in lifetime					<0.001				
1-3 Partners	5,689	44.8	12,000	46.5		3.81	2.64	5.28	<0.001
More than 4 partners	6,112	48.1	6,516	25.3		7.53	4.92	11.52	<0.001
None	907	7.1	7,281	28.2		ref			

Applicable if Respondent reported oral or anal sex with a male partner: Number of Male Sex Partners in Entire Life					0.002				
1-3 Partners	1,018	53.9	779	78.9		ref			
More than 4 Partners	872	46.1	208	21.1		3.21	1.47	7.00	0.004
Applicable if Respondent reported a male sex partner in last 12 months or responded DK: Last 12 months: Respondent had sex w/male IV drug user					0.310				
Yes	49	5.3	46	10.5		0.47	0.10	2.23	0.335
No	876	94.7	390	89.5		ref			
Applicable if Respondent reported any female sexual partners in last 12 months or if he did not know how many female partners he had in last 12 months: Last 12 months: Respondent Had Sex w/Female Having Sex With Others at around the Same Time					0.002				
Yes	3,423	13.8	2,337	9.5		1.54	1.13	2.10	0.007
No	21,169	85.3	22,269	90.2		ref			

Don't Know	223	0.9	75	0.3		3.11	0.89	10.83	0.074
Applicable if Respondent reported any female sexual partners in last 12 months or if he did not know how many female partners he had in last 12 months: Last 12 months: Respondent took money or drugs for sex from someone of opposite sex					0.003				
Yes	416	1.7	120	0.5		3.48	1.43	8.50	0.007
No	24,426	98.3	24,569	99.5		ref			
Applicable if Respondent reported a male sex partner in last 12 months or responded DK: Last 12 months: Respondent took money or drugs from male for sex					0.066				
Yes	29	3.1	39	8.8		0.34	0.09	1.29	0.109
No	901	96.9	405	91.2		ref			
How often used condom during sex last 12 months					0.003				
Every time	3,751	15.2	5,002	21.7		0.62	0.48	0.79	<0.001
Most of the time	3,609	14.6	3,206	13.9		0.92	0.69	1.24	0.588
About half of the time	1,219	4.9	924	4.0		1.08	0.67	1.76	0.745
Some of the time	3,236	13.	3,402	14.		0.78	0.6	0.99	0.039

		1		7			2		
None of the time	12,868	52.1	10,563	45.7		ref			
Number of male (same-sex) partners in last year for receptive anal sex					0.152				
None	65	9.0	53	20.1		ref			
1-3 Partners	505	69.4	188	70.7		2.19	0.55	8.64	0.314
More than 4 Partners	157	21.6	25	9.2		5.23	1.05	26.16	0.105
Applicable if Respondent reported oral or anal sex with a male partner: Number of same-sex partners in lifetime					0.042				
1-3 Partners	1,018	49.5	779	68.1		ref			
4 or More Partners	1,040	50.5	365	31.9		2.18	1.00	4.79	0.052
Applicable if Respondent older than 25 years old at screener: Formal Sex Ed Before 18: HIV/AIDS					0.338				
Yes	4,358	87.7	13,143	85.2		1.24	0.79	1.97	0.344
No	610	12.3	2,288	14.8		ref			
Last 12 months: Respondent Treated for STD					<0.001				
Yes	1,149	4.2	331	1.0		4.33	2.20	8.52	<0.001
No	26,010	95.8	32,428	99.0		ref			
Has doctor ever talked to					<0.001				

Respondent about HIV/AIDS									
Yes	10,953	39.8	5,718	17.4		3.15	2.54	3.91	<0.001
No	16,535	60.2	27,193	82.6		ref			
*Indicates a continuous variable; median and IQR reported									
**p-values are from Chi-square (or Fisher's Exact tests) for categorical variables and Mann-Whitney U tests for continuous variables									
AIDS=Acquired Immunodeficiency Syndrome DK=Do not know HIV=Human Immunodeficiency Virus IQR=Interquartile Range IV=Intravenous STD=Sexually Transmitted Disease									

TABLE 1B: Weighted estimates of selected characteristics of Female Respondents aged 15-44 years: National Survey of Family Growth, 2013-2015

	LIFETIME HIV TEST (in thousands)		NO LIFETIME HIV TEST(in thousands)		p-value**	cPOR	95% CI		p-value
	N	%	N	%					
Born Outside US					0.284				
Yes	6,737	18.0	3,818	16.1		1.16	0.88	1.51	0.286
No	30,421	81.9	19,931	83.9		ref			
English Proficiency					0.059				
Very Well/Well	34,796	93.8	22,598	95.7		ref			
Not Very Well/Not Well	2,282	6.2	1,010	4.3		1.47	0.98	2.20	0.064
Age Group					<0.001				
1st Quartile (15-21)	3,338	9.0	9,952	41.9		0.12	0.09	0.16	<0.001
2nd Quartile (22-28)	10,873	29.3	6,113	25.7		0.64	0.51	0.81	<0.001
3rd Quartile (29-35)	11,472	30.9	3,534	14.9		1.17	0.91	1.51	0.213
4th Quartile (36+)	11,478	30.9	4,150	17.5		ref			
Whether Respondent lacked healthcare coverage in last 12 months					<0.001				
Yes	9,729	26.2	4,418	18.6		1.55	1.22	1.95	0.001
No	27,403	73.7	19,230	81		ref			
Don't Know	28	0.1	85	0.4		0.24	0.06	0.96	0.044
Education					<0.001				
Less than High School	4,737	19.9	6,448	17.4		ref			
High School (12th grade/GED)	9,316	39.2	4,778	12.9		2.65	2.12	3.32	<0.001
Some College (no degree)	8,410	35.4	4,933	13.3		2.32	1.74	3.09	<0.001

College (Associates/Bachelors degree)	10,211	43.0	5,593	15.1		2.49	1.91	3.24	<0.001
More than 4 years College	4,487	18.9	1,997	5.4		3.06	2.14	4.28	<0.001
Ever Married					<0.001				
Yes	21,174	57.0	8,507	35.8		2.37	1.94	2.90	<0.001
No	15,986	43.0	15,242	64.2		ref			
Race and Hispanic Origin					<0.001				
Hispanic	7,892	21.2	4,565	19.2		1.27	1.01	1.60	0.040
Non-Hispanic White	19,299	51.9	14,191	59.8		ref			
Non-Hispanic Black	6,488	17.5	1,780	7.5		2.68	2.12	3.39	<0.001
Non-Hispanic Other or Multiracial	3,482	9.4	3,212	13.5		0.80	0.60	1.06	0.112
Has Respondent ever been pregnant					<0.001				
Yes	29,338	78.9	7,930	33.4		7.48	6.04	9.27	<0.001
No	7,823	21.1	15,819	66.6		ref			
Number of Current Non-Marital/Non-cohabiting Opposite-Sex Partners					0.005				
1 Partner	7,841	97.2	3,658	99.6		ref			
2 Partners	228	2.8	14	0.4		7.41	1.37	40.14	0.021
Last 12 Months How Often Drink Alcoholic Beverages					<0.001				
Never	7,222	19.5	7,235	30.7		ref			
Once or Twice during Year	7,646	20.6	5,249	22.3		1.46	1.20	1.78	<0.001

Several Times during Year	6,641	17.9	3,509	14.9		1.90	1.53	2.34	<0.001
About once a month	6,162	16.6	3,335	14.2		1.85	1.40	2.45	<0.001
About once a week	7,591	20.5	3,577	15.2		2.13	1.60	2.83	<0.001
About once a day	1,810	4.9	658	2.8		2.75	1.75	4.33	<0.001
Applicable if Respondent did not report ever injecting drugs w/o prescription: Ever in Life Shared IV Needle?					0.803				
Yes	342	50.6	39	55.1		0.83	0.19	3.74	0.807
No	334	49.4	32	44.9		ref			
Has Respondent ever had sex?					<0.001				
Yes	36,630	98.6	16,495	69.5		30.32	21.53	42.72	<0.001
No	531	1.4	7,253	30.5		ref			
Applicable if Respondent reported a male sex partner in last 12 months or responded DK: Has Respondent had sex with HIV-positive male					0.538				
Yes	50	0.1	12	0.1		1.87	0.23	15.02	0.550
No	33,970	99.9	15,370	99.9		ref			
Last 12 months how often Respondent injected non-prescription drugs					0.109				
Never	36,933	99.8	23,588	99.9		ref			

Once or Twice during Year	36	0.1	4	0.0		6.15	0.90	42.11	0.064
About once a month or more	39	0.1	9	0.0		2.73	0.38	19.73	0.312
Applicable if Respondent reported a male sex partner in last 12 months or responded DK: Last 12 months: Respondent gave money or drugs to male for sex					0.114				
Yes	79	0.2	12	0.1		2.38	0.70	12.32	0.138
No	33,942	99.8	15,380	99.9		ref			
Number of opposite-sex sex partners in lifetime									
1-3 Partners	12,618	38.1	9,792	43.2		17.60	12.33	25.11	<0.001
More than 4 partners	19,930	60.3	5,641	24.9		48.24	32.42	71.79	<0.001
None	531	1.6	7,253	32		ref			
Applicable if Respondent reported a male sex partner in last 12 months or responded DK: Last 12 months: Respondent had sex w/male IV drug user					0.471				
Yes	432	1.3	142	0.9		1.38	0.56	3.41	0.477
No	33,503	98.7	15,250	99.1		ref			

Applicable if Respondent reported any male sexual partners in last 12 months or if she did not know how many male partners she had in last 12 months: Last 12 months: Respondent Had Sex w/Male Having Sex With Others at around the Same Time					<0.001				
Yes	3,794	11.2	978	6.4		1.86	1.44	2.39	<0.001
No	30,029	88.3	14,388	93.5		ref			
Don't Know	174	0.5	21	0.1		3.91	0.84	18.13	0.081
Applicable if Respondent reported a male sex partner in last 12 months or responded DK: Last 12 months: Respondent took money or drugs from male for sex					0.572				
Yes	239	0.7	77	0.5		1.40	0.42	4.67	0.576
No	33,763	99.3	15,315	99.5		ref			
How often used condom during sex last 12 months					<0.001				
Every time	4,187	13.0	3,084	22.3		0.47	0.35	0.62	<0.001
Most of the time	2,316	7.2	1,576	11.4		0.50	0.37	0.69	<0.001
About half of the time	1,512	4.7	490	3.5		1.51	0.57	1.96	0.858
Some of the time	4,576	14.2	1,906	13.8		0.82	0.59	1.14	0.238

None of the time	19,714	61.0	6,759	48.9		ref			
Applicable if Respondent older than 25 years old at screener: Formal Sex Ed Before 18: HIV/AIDS					0.074				
Yes	6,369	89.7	10,847	85.7		1.46	0.94	2.25	0.088
No	728	10.3	1,806	14.3		ref			
Last 12 months: Respondent Treated for STD			23,538		<0.001				
Yes	2,218	6.0	345	1.5		4.28	2.24	8.20	<0.001
No	34,812	94.0	23,193	98.5		ref			
Has doctor ever talked to Respondent about HIV/AIDS					<0.001				
Yes	17,278	46.5	6,009	25.4		2.56	2.12	3.09	<0.001
No	19,866	53.5	17,693	74.6		ref			

*Indicates a continuous variable; median and IQR reported

**p-values are from Chi-square (or Fisher's Exact tests) for categorical variables and Mann-Whitney U tests for continuous variables

AIDS=Acquired Immunodeficiency Syndrome
DK=Do not know
HIV=Human Immunodeficiency Virus
IQR=Interquartile Range
IV=Intravenous
STD=Sexually Transmitted Disease

TABLE 2A: Weighted Adjusted Prevalence Odds Ratios in Men aged 15-44 years: National Survey of Family Growth, 2013-2015*

	Adjusted pOR*	95% CI		p-value
Age Group				
1st Quartile (15-21)	0.14	0.10	0.19	<0.001
2nd Quartile (22-28)	0.50	0.39	0.64	<0.001
3rd Quartile (29-35)	0.97	0.75	1.25	0.798
4th Quartile (36+)	ref			
Education				
Less than High School	ref			
High School (12th grade/GED)	1.35	1.04	1.75	0.027
Some College (no degree)	1.17	0.87	1.56	0.295
College (Associates/Bachelors degree)	1.15	0.86	1.54	0.327
More than 4 years College	1.99	1.23	3.22	0.006
Ever Married				
Yes	0.88	0.72	1.06	0.172
No	ref			
Race and Hispanic Origin				
Hispanic	1.24	0.96	1.61	0.101
Non-Hispanic White	ref			
Non-Hispanic Black	3.39	2.33	4.94	<0.001
Non-Hispanic Other or Multiracial	1.05	0.77	1.44	0.761
Last 12 Months How Often Drink Alcoholic Beverages				
Never	ref			
Once or Twice during Year	1.24	0.86	1.79	0.248
Several Times during Year	1.73	1.24	2.41	0.002
About once a month	1.72	1.13	2.63	0.013
About once a week	1.78	1.31	2.42	0.000
About once a day	1.60	1.08	2.36	0.019
Has Respondent ever had sex?				
Yes	3.07	2.09	4.51	<0.001
No	ref			

Has doctor ever talked to R about HIV/AIDS				
Yes	4.05	3.16	5.19	<0.001
No	ref			
*number of final outcomes modeled=59,983,271 (sum of weights used), number of observations used=4436				
AIDS=Acquired Immunodeficiency Syndrome HIV=Human Immunodeficiency Virus				

TABLE 2B: Weighted Adjusted Prevalence Odds Ratios in Women aged 15-44 years: National Survey of Family Growth, 2013-2015*

Table 2B: Weighted Adjusted Prevalence Odds Ratios in Women aged 15-44 years: National Survey of Family Growth, 2013-2015*				
	Adjusted pOR	95% CI		p-value
Age Group				
1st Quartile (15-21)	0.29	0.20	0.42	<0.001
2nd Quartile (22-28)	0.87	0.67	1.13	0.287
3rd Quartile (29-35)	1.25	0.93	1.69	0.144
4th Quartile (36+)	ref			
Education				
Less than High School	ref			
High School (12th grade/GED)	1.08	0.80	1.46	0.619
Some College (no degree)	1.11	0.78	1.59	0.556
College (Associates/Bachelors degree)	0.89	0.63	1.27	0.526
More than 4 years College	1.17	0.75	1.84	0.483
Ever Married				
Yes	0.61	0.47	0.80	0.001
No	ref			
Has Respondent ever been pregnant				
Yes	4.36	3.27	5.80	<0.001
No	ref			

Race and Hispanic Origin				
Hispanic	1.36	1.01	1.82	0.043
Non-Hispanic White	ref			
Non-Hispanic Black	3.42	2.45	4.77	<0.001
Non-Hispanic Other or Multiracial	0.92	0.68	1.25	0.576
Last 12 Months How Often Drink Alcoholic Beverages				
Never	ref			
Once or Twice during Year	1.24	0.94	1.64	0.132
Several Times during Year	1.55	1.14	2.09	0.005
About once a month	1.49	1.06	2.11	0.024
About once a week	1.88	1.30	2.72	0.001
About once a day	2.20	1.41	3.43	0.001
Has Respondent ever had sex?				
Yes	7.64	5.33	10.94	<0.001
No	ref			
Has doctor ever talked to R about HIV/AIDS				
Yes	2.59	2.10	3.19	<0.001
No	ref			
*number of final outcomes modeled=60,577,086(sum of weights used), number of observations used=5630				

TABLE 3: Respondent's Main Reason for never having an HIV test Weighted Responses: National Survey of Family Growth, 2013-2015*

	Men		**Women**	
	Frequency (in thousands)	Percent (%)	Frequency (in thousands)	Percent (%)
You have never been offered an HIV test	6,970	21.2	5,118	21.6
You are worried about what other people would think if you got tested for HIV	63	0.2	125	0.5
It's unlikely you have been exposed to HIV	23,241	70.6	17,087	72.2
You were afraid to find out if you were HIV positive (that you had HIV)	189	0.6	193	0.8
You don't like needles	970	3.0	529	2.2
Some other reason	1,106	3.4	441	1.9
Respondent reported spouse or partner tested negative	92	0.3	0	0.0
Never had sexual intercourse	133	0.4	168	0.7
No health insurance or coverage, or Respondent couldn't afford an HIV test	58	0.2	21	0.1
Don't know	94	0.3	0	0.0
Total	32,921		23,682	

*2,418 men unweighted and 2,094 women unweighted