

Full Length Research Paper

Rapid human immunodeficiency virus (HIV) testing on the college campus: Comparing traditional and outreach models

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The purpose of this study was to compare rapid human immunodeficiency virus (HIV) testing services on a college campus between a clinic-based group and an outreach-based group. Study participants were 1,233 individuals who underwent HIV counseling and testing. Questionnaires assessed demographics and HIV transmission risk behaviors. Results indicate that outreach-based testers were more likely to be younger, female, and African American relative to clinic-based testers. Overall 100% of clinic-based testers and 99.5% of outreach-based testers received their test results. All individuals with positive rapid test results received confirmatory blood testing and entered medical care within one week of preliminary diagnosis. College campuses may provide a unique setting to deliver HIV testing and may help increase the percentage of young people who are aware of their serostatus, particularly younger, female, and African American students who may be less likely to undergo testing in traditional clinic settings.

Key words: Rapid human immunodeficiency virus (HIV) testing, college students, outreach HIV testing.

INTRODUCTION

Nearly 40% of all new human immunodeficiency virus (HIV) infections in the United States occur among adolescents and young adults under the age of 29, primarily via sexual activity (Centers for Disease Control and Prevention [CDC], 2011). However, college students have not traditionally been viewed as a population at high risk for HIV transmission, despite being a sub-population that has recently experienced a rising incidence rate. The first HIV outbreak among college students was documented between 2000 to 2003, among 84 college students, most of whom were men who had sex with men (MSM) or men who had sex with men and women. These cases spread across 37 academic institutions, and a sexual partner network investigation linked 21 colleges, 61 students, and 8 partners of students (Hightow et al., 2005).

Recent research has demonstrated that young adults have a low perceived risk of HIV infection (Opt and Loffredo, 2007; Sutton et al., 2011) despite engaging in high-risk behaviors that may expose them to HIV and

other sexually transmitted infections (Trepka et al., 2008). In addition, previous studies have shown that although college students possess accurate knowledge about HIV transmission and methods of protection, this knowledge does not necessarily translate into health-promoting safer sex behaviors (Opt and Loffredo, 2004; Sutton et al., 2011). While most college students report being sexually active, (American College Health Association, 2012) self-reported HIV testing does not mirror sexual activity behaviors, with testing rates ranging from 21 to 52% (Buhi et al., 2010; Caldeira et al., 2012). This low testing prevalence may be partially explained by the low perceived risk of HIV infection.

It is estimated that approximately 20% of individuals who are living with HIV in the United States are unaware of their HIV status and may transmit HIV without knowing that they are putting partners at risk (CDC, 2008). This rate is more striking among young people, with estimates that nearly half of 13 to 24 year-olds living with HIV have not been diagnosed (Campsmith et al., 2010). Two main

factors may contribute to this lack of awareness: never being tested or failure to receive results after being tested. HIV prevention efforts have traditionally included information not only about risk reduction such as safer sex practices, but also about the importance and availability of HIV testing for those at risk.

Many public health advocates argue that rapid testing will continue to revolutionize HIV testing by reducing or perhaps eliminating the need to return for test results on a later date, thus increasing the proportion of HIV-positive individuals who are aware of their status. Furthermore, efforts to increase testing rates and reduce fear associated with testing need to normalize the testing process and decrease the stigmatization of test-seeking behaviors (Anastasi et al., 1999).

In 2003, CDC introduced the Advancing HIV prevention initiative in an effort to increase the proportion of persons aware of their HIV serostatus. One strategy of the initiative is to implement new models for diagnosing HIV infections outside medical settings. Three years later, the CDC released a report outlining their revised recommendations for HIV testing, which included not only routine screening for HIV among adults, adolescents, and pregnant women in health care settings in the United States, but also advocated for reducing barriers to HIV testing (Branson et al., 2006).

Rapid HIV testing may aid in increasing the proportion of individuals living with HIV who know their status, by increasing the number of persons who are actually tested and receive test results (Spielberg et al., 2005; Hutchinson et al., 2006). In addition, there is a high likelihood of entry into medical care after receiving an HIV diagnosis for those who undergo rapid testing, as individuals are often quickly linked to a health care provider (Leider et al., 2011; Sattin et al., 2011). In particular, those who are diagnosed with a rapid HIV test have relatively high rates of adherence to their first medical appointment (Kendrick et al., 2005; Roberts et al., 2007).

While previous studies have examined preferences for HIV testing methods such as rapid oral fluid, rapid fingerstick, and traditional venipuncture among different populations (Cohall et al., 2010; Huebner et al., 2010), few studies have compared rapid oral fluid testing based on the test location or setting, and no studies have compared such testing among young adults or college students in particular.

The availability and accessibility of voluntary counseling and testing services utilizing rapid HIV testing technology can serve a key niche in controlling the spread of the virus and reducing transmission rates. Although HIV prevention research on college campuses has been conducted, few studies have examined the demographic characteristics and reported HIV risk behaviors of a sample of young adults undergoing rapid HIV antibody testing based on test setting. The first objective of this study was to survey and compare demo-

graphics, reported risk behaviors, and previous HIV testing experiences of individuals seeking rapid oral testing at a clinic-based service versus an outreach-based event. The second objective was to address practical implications of offering rapid oral HIV testing on a college campus, including receipt of test results and linkages to care for those who test positive.

MATERIALS AND METHODS

Participants and procedures

After approval by the Institutional Review Board of the University of North Carolina at Chapel Hill, a retrospective analysis of two groups receiving HIV counseling and testing on a college campus in the Southeast was conducted. The first group included clients at the counseling and wellness office of the university's student health service between March 1, 2005 and February 28, 2007. The second group included clients attending two outreach-based, walk-in rapid HIV testing events on the same college campus during this time period.

The first group included individuals who received counseling and testing by one of four state-certified HIV counselors at the counseling and wellness office. An identification number was assigned to each client in person or over the telephone, when scheduling an appointment, to ensure anonymity in the scheduling process. Those clients who consented to HIV counseling and testing underwent a standard pre-test counseling session in compliance with state guidelines. During this pre-test session, counselors identified and recorded client demographics, HIV transmission risk behaviors in the previous 12 months, and any previous HIV testing experience, using the state-developed counseling and testing form.

Clients requesting a rapid oral test self-administered an OraQuick® *Advance*™ Rapid HIV-1/2 Antibody Test (OraSure Technologies, Inc., Bethlehem, Pennsylvania). Testing of the collected specimen was conducted by counselors. After 20 min, counselors delivered test results to clients and provided immediate post-test counseling, including an explanation of the meaning of the test result, a discussion of the need for follow-up testing for those clients in the window period, risk reduction counseling, and distribution of condoms and sexual health pamphlets. Preliminary positive test results were delivered by the original pre-test counselor, and clients immediately received confirmatory blood testing on site, as well as referral to an infectious disease physician. The 438 clients requesting a traditional venipuncture test at the counseling and wellness office during the two-year time period are excluded from this analysis.

The second group included individuals receiving HIV counseling and testing at two outreach-based walk-in HIV testing events on December 1, 2005 and December 1, 2006. In conjunction with broader World AIDS Day activities, the rapid HIV testing events were integrated into awareness events taking place on the same college campus. Recruitment efforts focused primarily on the student population via fliers, newspaper advertisements, volunteers hosting an HIV informational booth in a central location on campus, and a candlelight memorial vigil held the preceding evening. The outreach-based walk-in testing events were held in a high-traffic campus location, and testing was offered for free to the general public.

The testing protocol was standardized to ensure efficiency and consistency. First, individuals were greeted by a volunteer who described the counseling and testing procedure. Interested individuals were then given a packet of information that included a risk assessment form, two copies of the informed consent form, an

information sheet on rapid HIV testing, and a sticker with a unique identification number. Individuals completed the risk assessment form that included demographic questions, HIV transmission risk behaviors in the previous 12 months, and previous HIV testing experience. Clients were then called by their identification number to meet with a trained HIV counselor, with whom they reviewed HIV transmission routes, HIV antibody rapid testing protocols, risk reduction strategies, and implications of positive and negative results. Individuals comfortable with the testing process signed the consent form and self-administered an oral OraQuick® *Advance*™ Rapid HIV-1/2 Antibody Test. Clients returned to the waiting area while their tests were run in a separate room.

Post-test counselors called clients by their unique identification numbers and delivered test results to individuals in a private room, explained the test results, and encouraged those clients who had engaged in high risk behavior within the last three months to seek further testing. Preliminary positive test results were delivered to clients by their original pre-test counselor who discussed the implications of a positive antibody test and the need for an immediate follow-up confirmatory blood test. Clients then had the opportunity to meet with an infectious disease physician in conjunction with the counselor who arranged confirmatory testing and an appointment at the local infectious disease clinic.

Statistical analysis

A comparison of demographic variables, reported sexual risk behaviors, and previous HIV testing between the two groups was conducted using Stata version 11.0 (Stata Corporation, College Station, Texas). Basic descriptive statistics were performed to determine the proportion of individuals who underwent testing at the counseling and wellness office versus the outreach-based setting during the study time period. Chi-square tests of association were used to determine differences in participant characteristics based on test setting. Logistic regression models were used to assess whether demographic variables, sexual risk behaviors, and previous HIV testing were associated with test setting. Variables that had a p value of < 0.05 in bivariate analyses were entered into a multivariate logistic regression model to evaluate the independent associations between the predictor variables and test setting. Their respective odds ratios and 95% confidence intervals were calculated.

RESULTS

Description of study participants

During the study period, a total of 792 clinic-based testers and 441 walk-in testers underwent HIV counseling and testing. Table 1 presents the demographic characteristics, sexual risk behaviors, and previous HIV testing experience of the two groups. The outreach-based testing group had a higher proportion of female testers (63.7%) than the clinic-based testing group (54.3%). The mean age of outreach-based testers was 21.26 years (standard deviation [SD] = 3.81) compared to 23.64 years (SD = 4.28) for clinic-based testers. The majority of outreach-based testers (82.9%) were between the ages of 18 to 22, a traditional undergraduate student age range, compared to approximately 50.3% of clinic-based testers. The outreach-based testing group had a higher proportion of Black/African Americans (36.7%)

than the clinic-based group (16.8%).

Risk behaviors

Overall, most individuals who underwent HIV testing were sexually active, with 89.7% of the respondents reported at least one sexual partner in the last 12 months (87.5% of outreach-based testers and 90.9% of clinic-based testers). In terms of reported sexual behaviors among those who were sexually active in the previous 12 months overall, 42.5% reported engaging in sexual activity while using non-injecting drugs such as alcohol or marijuana (17.7% of outreach-based testers and 56.3% of clinic-based testers). Almost half of clinic testers (46.2%) reported sex with some other HIV risk, such as sex with multiple partners in the past year, compared to outreach-based testers (14.1%). Overall, a small percentage of testers reported engaging in sexual activity with a person who they knew had HIV (0.2% of outreach-based testers and 2.3% of clinic-based testers) and few reported sexual activity with an intravenous drug user (0.2% of walk-in testers and 1.6% of clinic-based testers). Eleven percent of the overall sample reported having sex with a man who has sex with men, with a higher proportion found among clinic-based testers. In addition, 8.4% reported receiving a sexually transmitted infection (STI) diagnosis in the previous 12 months, with a greater proportion among clinic-based testers compared to outreach-based testers (11.6% versus 2.7%, respectively). There was also a noted difference in reported sexual violence, with 4.7% of clinic testers reporting sexual assaults in the past year compared with 0.4% among walk-in testers. In terms of previous HIV testing experience, approximately half of participants reported being tested for HIV (49.6%), with a higher proportion of clinic-based testers reporting previous testing (55.9%) compared to outreach-based testers (38.3%).

Bivariate analysis

Three demographic variables were significantly associated with the outcome variable of being tested at an outreach-based event, with females, younger respondents, and Blacks/African Americans being more likely to undergo HIV counseling and testing at an outreach-based event versus clinic-based testing. Six sexual risk variables were significantly associated with testing site, including the following reported behaviors in the previous 12 months: sex while using non-injecting drugs, sex with an HIV-positive person, sex with a man who has sex with men, sex with other HIV risk (such as, multiple partners), STI diagnosis, and sexual assault. Finally, previous HIV testing was significantly associated with testing site, with first-time testers being more likely to be screened at outreach-based events than clinic-based testing services.

Table 1. Characteristics of study participants by HIV testing site.

Variable	Total (n = 1,233) (%) ^a	Clinic-based testing (n = 792) (%)	Outreach testing (n = 441) (%)	χ^2 p-value
Demographics				
Gender				
Female	57.6	54.3	63.7	0.001
Male	42.4	45.7	36.3	
Age group				
18-22	61.2	50.3	82.9	0.001
>22	38.2	49.7	17.1	
Race/Ethnicity				
Black, not Hispanic	23.9	16.8	36.7	<0.001
White, not Hispanic	62.4	69.2	50.1	
Other	13.7	14.0	13.2	
Sexual behavior in previous 12 months				
Any sexual activity	89.7	90.9	87.5	0.064
Sex while using non-injecting drugs	42.5	56.3	17.7	<0.001
Sex with both genders	4.6	4.7	4.3	0.755
Sex with HIV+ person	1.6	2.3	0.2	0.007
Sex with IV drug user	1.2	1.6	0.2	0.062
Sex with MSM	11.1	13.6	6.5	<0.001
Sex with other risk	34.7	46.2	14.1	<0.001
MSM ^b	34.0	34.1	33.8	0.934
STI diagnosis	8.4	11.6	2.7	<0.001
Sexual assault	3.2	4.7	0.4	<0.001
Previous HIV testing experience				
Any previous HIV test	49.6	55.9	38.3	<0.001

^aTotals do not always match due to missing data; ^bMale participants only. MSM = men who have sex with men, IV=intravenous, STI = sexually transmitted infection.

Multivariate analysis

The final model consisted of seven variables and is presented in Table 2. Younger individuals (between the ages of 18 to 22) were more than four times as likely to be tested at an outreach-based event than in a clinic setting ($p < 0.001$). Race and gender were also significantly associated with testing in an outreach-based setting. Specifically, outreach-based testers were one and a half times as likely to be Black/African American and one and a half times as likely to be female ($p < 0.05$ and $p < 0.01$, respectively). Individuals who reported sexual risk behaviors including sex while using non-injecting drugs and sex with other HIV risk were 77% less likely to be tested at outreach-based events ($p < 0.001$ and $p < 0.01$, respectively). In addition, those individuals

who reported receiving an STI diagnosis or sexual assault in the last year were less likely to undergo HIV testing at an outreach-based event ($p < 0.01$ and $p < 0.001$, respectively).

Receipt of test results

Post-test counseling rates were high in both groups, with 100% of clinic-based testers and 96.6% of outreach-based testers receiving their results the same day of testing. Thirteen individuals (2.9%) who underwent outreach-based testing received their test results on a later date through the counseling and wellness office (range = 1 to 12 days after testing). Two individuals failed to return to receive test results after repeated attempts to

Table 2. Final logistic regression model predicting outreach-based testing.

Final model variables	Adjusted OR ^a	95% CI ^b
Gender: Female	1.53**	1.14-2.04
Age group: 18-22 years	4.41***	3.21-6.06
Race: Black, not Hispanic	1.51*	1.09-2.10
Sex while using non-injecting drugs	0.29***	0.21-0.40
Sex with other HIV risk	0.29**	0.21-0.42
STI diagnosis	0.339**	0.17-0.68
Sexual assault	0.095***	0.02-0.42

^aOR = odds ratio; ^b CI = confidence interval; *p < 0.05; **p < 0.01; ***p < 0.001.

contact them (0.5%).

Linkages to care

Overall, four individuals (0.3%) were newly diagnosed with HIV, two of whom underwent HIV testing at the counseling and wellness office and two at an outreach-based testing event. All four individuals with positive rapid test results accepted referral to medical care, received confirmatory blood testing, and entered medical care with the completion of a follow-up appointment with an infectious disease physician within one week of preliminary diagnosis. These individuals were subsequently confirmed to be HIV positive by Western blot testing, with no indeterminate or false positive tests.

DISCUSSION

Study findings suggest that college campuses may provide a unique setting for students to access HIV testing, particularly younger, female, and African American students who may be less likely to undergo testing in traditional clinic settings. The move away from the medical testing model reduced logistical barriers of scheduling and keeping appointments by bringing testing opportunities directly to the student population and expanding the venues in which HIV testing is conducted. A higher proportion of first-time testers were found at outreach-based events, which is a promising finding that may help to increase the percentage of young people who are aware of their serostatus, and who may not have opted to undergo HIV testing in a medical care setting.

A higher proportion of risk behaviors related to sex while using non-injecting drugs, sex with multiple partners, and sex with an HIV-infected person was found among the clinic-based group. It is possible that these higher rates are expected, as those who engage in risk behaviors are more likely to schedule an appointment for HIV testing as a way to determine their serostatus.

Approximately 8% of the overall sample reported receiving an STI diagnosis in the last year, consistent with a recent study among college students (American College Health Association, 2012). Clinic-based testers were more likely to report an STI diagnosis as well as sexual assault in the previous 12 months compared to outreach-based testers. These differences are not surprising, as many individuals who are diagnosed with an STI or who are survivors of sexual assault are commonly referred to the counseling and wellness office for subsequent HIV testing.

Despite higher risk behaviors reported in the clinic-based group, there was no significant difference in the percentage of HIV-positive cases identified between the two groups. As one of the primary goals of HIV testing is to help individuals be aware of their status, offering testing services in different venues may appeal to individuals for different reasons and outreach-based screening may be attractive to college students who have a low perceived risk of contracting HIV and yet are unaware of their status.

Data from our study indicate that receipt of test results was very high regardless of test location, with 100% of clinic-based testers and 99.5% of outreach-based testers learning their test result. These rates are consistent with previous studies on receipt of rapid test results in both clinic-based settings (Guenter et al., 2008; Kendrick et al., 2005) and outreach-based settings (Liang et al., 2005; Bucher et al., 2007). However, these rates were higher than that found in a CDC demonstration project of eight community-based organizations in which we found a test receipt rate of 75% (CDC, 2007).

Every individual who received preliminary positive results in our study was immediately referred to an infectious disease physician prior to receipt of confirmatory test results, consistent with findings suggested from a CDC-funded, multi-site Advancing HIV Prevention demonstration project (Bowles et al., 2008). This approach eliminates the need for clients to schedule two separate appointments to first receive confirmatory test results and then to follow-up with appropriate medical care. Individuals who tested positive at the outreach-

based events in particular had the opportunity to and met with an infectious disease physician immediately after their preliminary diagnosis, which may have also assisted in their acceptance of referral and subsequent linkage to care. Notably, recent advances in HIV testing suggest the use of an immediate second rapid HIV test as verification of a reactive first test to allow for on-site confirmation (Martin et al., 2011). Although not commonly conducted at the time of the present study, this new strategy is a promising alternative approach to the traditional method of waiting several days for a laboratory-based Western blot antibody confirmation and can aid in immediate linkage to care to avoid potential delays in treatment.

This investigation has some limitations that warrant discussion. First, our results reflect HIV testing at one public university in the Southeastern United States, which may affect the generalizability of our findings. Due to the retrospective nature of this study, it is not possible to verify self-reported sexual risk behaviors among those undergoing HIV testing. It is plausible that some participants may have provided inaccurate responses to questions regarding sexual risk behaviors for reasons of social desirability. Finally, the study did not track the rate of acceptance of rapid testing, specifically among participants at outreach-based events, and it is not possible to calculate the number of persons who initially expressed interest in obtaining a rapid oral HIV test but declined testing.

CONCLUSION

This study offers several practical implications of offering rapid oral HIV counseling and testing on a college campus for both clinic-based and outreach-based settings. First, the ability to provide HIV testing with fast, reliable test results was an advantage observed by test seekers and we found high rates of receipt of test results in both settings. Second, by offering outreach-based testing in a non-medical setting, we were able to access a population that may not be routinely engaged in routine medical care. Hosting outreach-based testing events in a high-traffic environment may have helped to destigmatize HIV testing and normalize the process among young people. The outreach testing events were also incorporated into the daily routines of individuals on college campuses rather than limiting HIV testing to a medical facility. It is postulated that the public nature of outreach-based testing events promoted conversation about HIV in general, and testing in particular, thus reducing stigma that surrounds both issues.

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