

The Unexpected Movement of the HIV Epidemic in the Southeastern United States

Transmission Among College Students

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Background: Approximately 16 million people are enrolled in institutions of higher learning in the United States. However, college students have not been perceived as at high risk for HIV infection. In early 2003, acute HIV infection was diagnosed in 2 men attending college in North Carolina. We describe an epidemiologic investigation of newly diagnosed HIV infection in men attending college in North Carolina.

Methods: We reviewed state surveillance records examining new HIV diagnoses in men 18–30 years old between January 1, 2000 and December 31, 2003, living in 69 North Carolina counties. Risk behavior and demographic information for HIV-infected men enrolled in college were compared with HIV-infected male nonenrollees.

Results: Of the 735 records available for review, 84 (11%) were college men. Eighty-seven percent of college men were African American and 92% were men who have sex with men (MSM) or men who have sex with men and women (MSM/W). Compared with non-college men, college men were more likely to be African American (odds ratio 3.70, 95% CI = 1.86–7.54), to report meeting sex partners at bars or dance clubs (odds ratio 3.01, 95% CI = 1.77–5.10) or on the Internet/chat lines (odds ratio 4.95, 95% CI = 2.53–9.64), or to report use of “ecstasy” or club drugs (odds ratio 4.51, 95% CI = 1.15–15.40). Newly diagnosed HIV infection was found in men in 37 colleges located in North Carolina or surrounding states and a sexual partner network investigation linked 21 colleges, 61 students, and 8 partners of students.

Conclusion: We describe an epidemic of HIV infection occurring in North Carolina college students, primarily involving African American MSM and MSM/W. College students represent an at-risk, accessible population, which deserves further HIV prevention interventions.

Key Words: HIV, college students, men who have sex with men, bisexual

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It has been estimated that half of all new HIV infections occur in individuals under the age of 25 years,¹ with young men who have sex with men (MSM) of color at particularly high risk.^{2–4} The Young Men’s Survey estimates an HIV incidence of 14.7% per year among African American MSM in their 20s, compared with an incidence of 2.5% per year among white MSM of the same age.^{3,4} Additionally, young MSM have been found to be more likely to engage in high-risk sexual practices compared with older MSM.⁵

Approximately, 16 million people are enrolled in institutions of higher education in the United States and almost two-thirds of these students are less than 30 years of age.⁶ However, college students have traditionally been perceived as being at low risk for HIV infection based on a single seroprevalence study conducted almost 15 years ago.⁷ Published studies suggest that both homosexual and heterosexual college students engage in high-risk behaviors such as inconsistent condom use,^{8–14} use of drugs and alcohol during sex,^{13,15,16,17} and sex with multiple partners.^{8,13} Additionally, the perceived pleasure of unprotected sex has been found to drive college students’ participation in high-risk sexual activities.¹⁸ Despite engaging in these high-risk activities, college students have been found to have a low perceived risk of HIV infection.^{15,19–21}

In early 2003, acute HIV infection was diagnosed in 2 male students attending different colleges in the same city in North Carolina. We describe an epidemiologic investigation of newly diagnosed HIV infections in men attending college in North Carolina. Our results strongly indicate a need for more effective HIV prevention interventions targeting young MSM of color on college campuses.

METHODS

To determine the number of college students newly infected with HIV in North Carolina, we conducted a review of

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North Carolina HIV/AIDS surveillance records for men ages 18–30 years in whom HIV infection was newly diagnosed between January 1, 2000 and December 31, 2003. State surveillance records available for review included all reports and interview records filed by disease intervention specialists (DIS), as well as data from voluntary counseling and testing (VCT) sites on patients in whom HIV infection had been diagnosed and contacts of patients as reported to DIS. In an effort to perform a timely and complete public health investigation, we chose to review records from 69 of 100 North Carolina counties that have the highest HIV prevalence and the largest number of colleges and universities.

North Carolina has 135 VCT sites throughout the state and performs approximately 110,000 HIV antibody tests each year.²² In an attempt to recognize acute HIV infections that would be missed by routine antibody tests, North Carolina's State Laboratory of Public Health implemented a novel HIV testing program beginning in November 2002 that added HIV RNA screening to all antibody enzyme-linked immunosorbent assay (ELISA)-negative samples from public funded VCTs. This unique state testing program—the Screening and Tracing Active Transmission Program (STAT)—used protocols for specimen pooling and HIV RNA testing analogous to those used in the nation's blood banks.²³ To monitor HIV incidence, data on social and sexual networks obtained during interviews are systematically collected in a confidential database and reviewed weekly by STAT program senior staff.

In North Carolina, where HIV reporting is mandatory, DIS are assigned to investigate any positive HIV test result reported to the state or local health department by a medical provider or clinical laboratory. After verifying that the person had not been previously reported to the state as HIV infected, DIS contact the patient's medical provider to initiate partner counseling and referral services (PCRS), review medical records to obtain demographic and clinical information about the reported index patient, and attempt to contact the patient to conduct a voluntary, confidential, in-depth interview.²² Information routinely collected during this process includes place of employment or school attendance, information on risk behaviors, and information on all sexual or needle-sharing partners within the last year. PCRS has been in place in North Carolina since 1989.²³ This surveillance record review was considered part of a public health epidemiologic investigation exempt from institutional review board approval.

We conducted a cross-sectional comparison of risk behavior and demographic information of male college enrollees with newly diagnosed HIV infection (college men, or CM) to men with newly diagnosed HIV infection who were not currently enrolled in college (non-CM). Also, we examined potential sexual partner and social/sexual network links, as defined by CM self-reports to DIS of sexual partners at their college of enrollment or sexual partners at other colleges. This was achieved through manual review of all DIS interview records as well as counseling and testing site (CTS) data recorded about index patients in whom HIV had been diagnosed and their contacts from January 1, 2000 through December 31, 2003.

New HIV infection rates among African American male students were calculated for the years 2000–2003 for colleges

with >5 students in whom HIV had been diagnosed during the 4-year investigation period. These new infection rates were calculated by dividing the number of African American male students in whom HIV was diagnosed during each year by the total enrollment of African American male undergraduates at that school in the same year. In addition, we calculated minimum new HIV infection rates for black men attending all colleges and universities in North Carolina. These new HIV infection rates were calculated by dividing the number of African American male students in whom HIV was diagnosed during each year by the total enrollment of African American male undergraduates attending college in North Carolina in the same year. We assumed that enrollment data from the year 2001 was similar to that in years 2000, 2002, and 2003. No adjustment was made for history of testing.

We calculated test statistics and *P* values (2-sided) for continuous variables (*t* statistic) and Mantel-Haenszel odds ratios (ORs), 95% CIs, and χ^2 *P* values (2-sided) for binary variables using Epi Info 2002 (Centers for Disease Control and Prevention, Atlanta, GA) and Stata software (version 7.0, Stata Corporation, College Station, Texas). Given the small sample size, exact methods were used to compare proportions.

RESULTS

Between January 1, 2000 and December 31, 2003, 998 men aged 18–30 years were reported with newly diagnosed HIV infection in all 100 North Carolina counties. We reviewed reports from 69 of the 100 North Carolina counties. Of 735 reports (74%) available for review, 84 (11.4%) were CM compared with 651 (88.6%) that were non-CM (Table 1). Of the CM, 6 cases were reported in the calendar year 2000, 19 were reported in 2001, 29 in 2002, and 30 cases were reported in 2003 (Fig. 1).

Of the 84 CM, 12 cases were found to be either acutely or recently infected, defined by either the presence of a documented negative HIV antibody test with a subsequent positive HIV antibody test <6 months after the negative HIV antibody test (7 cases) or the detection of HIV RNA in plasma in the presence of a negative Western blot and ELISA (5 cases) (see “Methods”).

The mean age of CM was 21.8 years (SD, 3.1 years) and the mean age of non-CM was 25.4 years (SD, 3.4 years) (*P* < 0.01). Of the 84 CM, 11 (13%) were white and 73 (87%) were African American. Forty-nine (58%) of the CM and 324 (50%) of the non-CM reported sex with men only during the 1 year prior to their HIV diagnosis. Twenty-eight (33%) of the CM compared with 76 (12%) of the non-CM reported sex with men and women during the 1-year period prior to their HIV diagnosis. Three (3.6%) of the CM compared with 192 (29.5%) of the non-CM reported sex with women only in the 1 year prior to diagnosis.

Compared with non-CM, CM (Table 1) were more likely to be African American (OR = 3.70, 95% CI = 1.86–7.54) and less likely to be Hispanic (OR = 0.08, 95% CI = 0.00–0.49). CM were more likely than non-CM to be diagnosed with acute or recent HIV infection (OR = 3.33, 95% CI = 1.54–7.11). In the year prior to their HIV diagnosis, CM were more likely to

TABLE 1. Frequency of Selected Characteristics for Newly Diagnosed HIV-Infected Male College Students From January 2000–December 2003 in 69 North Carolina Counties

Characteristics	College Men (%) (n = 84)	Noncollege Men (%) (n = 651)	Odds Ratio (95% CI)
Race			
White	11 (13.1)	129 (19.8)	0.61 (0.30–1.23)
Black	73 (86.9)	418 (64.2)	3.70 (1.86–7.54)
Hispanic	0 (0)	82 (12.6)	0.08 (0–0.49)
Other/unknown	0 (0)	22 (3.4)	0.34 (0.01–2.19)
HIV diagnosis			
Acute/recent*	12 (14.3)	31 (4.7)	3.33 (1.54–7.11)
Prevalent†	64 (76.2)	515 (79.1)	0.85 (0.48–1.56)
AIDS‡	8 (9.5)	105 (16.1)	0.55 (0.24–1.22)
Syphilis coinfection	7 (8.3)	40 (6.1)	1.39 (0.55–3.37)
Previous HIV test	33 (39.3)	279 (42.9)	0.86 (0.53–1.41)
Gender of sexual partners§			
Women only	3 (3.6)	192 (29.5)	0.09 (0.02–0.29)
Men only	49 (58.3)	324 (49.8)	1.41 (0.87–2.30)
Both men and women	28 (33.3)	76 (11.7)	3.78 (1.52–5.92)
Unknown	4 (4.8)	59 (9.1)	0.50 (0.15–1.49)
Known sexual relations with			
IVDU	0 (0.0)	16 (2.5)	0.48 (0.02–3.49)
Bisexual man	13 (15.5)	74 (11.4)	1.43 (0.71–2.81)
Person with HIV/AIDS	11 (13.1)	159 (24.4)	0.47 (0.23–0.93)
Exchanged sex for drugs or money			
Anonymous sex	3 (3.6)	96 (14.7)	0.21 (0.04–0.67)
Patron of bars/dance clubs	36 (42.9)	139 (21.4)	2.76 (1.68–4.54)
Places to meet sex partners			
Bars/dance clubs	29 (34.5)	97 (14.9)	3.01 (1.77–5.10)
Internet	18 (21.4)	34 (5.2)	4.95 (2.53–9.64)
College campus	8 (9.5)	2 (0.3)	34.16 (6.59–332.59)
Prior incarceration	4 (4.8)	126 (19.4)	0.21 (0.05–0.57)
Travel outside NC	34 (40.5)	173 (26.6)	1.88 (1.14–3.08)
Recreational drug use			
Type of drug used			
IVDU	1 (1.2)	11 (1.7)	0.70 (0.02–4.94)
“Crack”	0 (0)	46 (7.1)	0.16 (0.00–0.96)
Cocaine (not crack)	4 (4.8)	54 (8.3)	0.55 (0.14–1.56)
Marijuana	21 (25.0)	200 (30.7)	0.75 (0.43–1.30)
“Ecstasy”	5 (6.0)	9 (1.4)	4.51 (1.15–15.40)
Alcohol	40 (47.6)	318 (48.8)	0.95 (0.59–1.54)

*Acute: documented negative HIV antibody test with a subsequent positive HIV antibody test <8 weeks after the negative HIV antibody test, or the presence of HIV RNA detected in plasma in the presence of a negative Western blot and ELISA. Recent: documented negative HIV antibody test and a subsequent positive HIV antibody test 8 weeks–6 months later.

†Prevalent: Both a documented negative HIV antibody test and a subsequent positive HIV antibody test that occurred >6 months later or newly diagnosed as being HIV infected having a CD4 count >200 without evidence of any opportunistic infection.

‡AIDS: new diagnosis of HIV with a CD4 count <200 or evidence of any opportunistic infections.

§Gender of sexual partners in the 1 year prior to HIV diagnosis. IVDU, intravenous drug user.

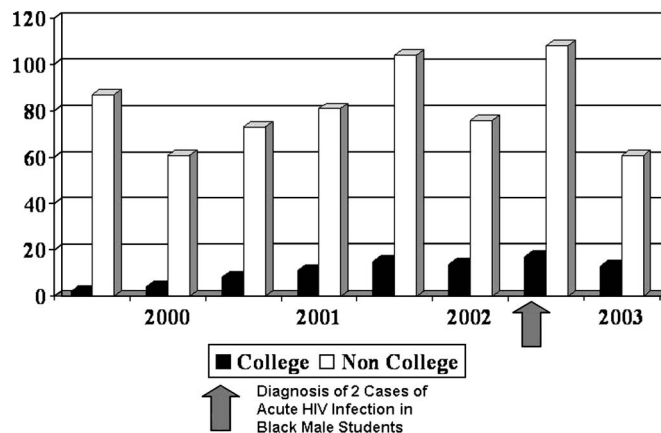


FIGURE 1. New HIV diagnoses in CM and non-CM from January 2000–December 2003 in 69 North Carolina counties.

report sex with both men and women (OR = 3.78, 95% CI = 1.52–5.92) and less likely to report sex with women only (OR = 0.09, 95% CI = 0.02–0.29). CM were more likely to report meeting sex partners at bars or dance clubs (OR = 3.01, 95% CI = 1.77–5.10), over the Internet or through telephone chat lines (OR = 4.95, 95% CI = 2.53–9.64), or on college or university campuses (OR = 34.16, 95% CI = 6.59–332.59). Use of “ecstasy” or other club drugs was more common among CM (OR = 4.51, 95% CI = 1.15–15.40). No significant differences were found between CM and non-CM with regard to general drug use, syphilis coinfection, reporting sex with only male partners, and engaging in anonymous sex.

Overall, we found cases of newly diagnosed HIV infection in 84 young men attending 37 different colleges and universities located throughout North Carolina as well as in 5 surrounding states. We constructed a sexual partner network through data obtained in DIS interview records of CM as well as with their contacts. We examined potential sexual partner and social/sexual network links, as defined by CM self-reports to DIS of sexual partners at their college of enrollment or sexual partners at other colleges. This sexual partner network investigation linked 21 colleges, 61 students, and 8 sex partners of students (Fig. 2).

New HIV infection rates (per 100,000 persons) were calculated among African American male students at 5 North Carolina colleges/universities with >5 students in whom HIV infection was diagnosed in the investigation period (Fig. 3). These rates were compared with new HIV infection rates among African Americans attending all colleges and universities located in North Carolina and with rates among African American men of the same age group in North Carolina. Compared with rates among African American men of the same age group in North Carolina, new HIV infection rates were higher in all 5 schools in 2002 (rate range 117–388 per 100,000 persons) and in 3 of the schools in 2003 (rate range 151–583 per 100,000 persons). The overall rate in North Carolina was 110 and 119 per 100,000 persons in years 2002 and 2003, respectively. The overall rate of new HIV infection among African American men attending college in North Carolina increased from 15 per 100,000 persons in 2000 to 79 per 100,000 persons in 2002 and 2003.

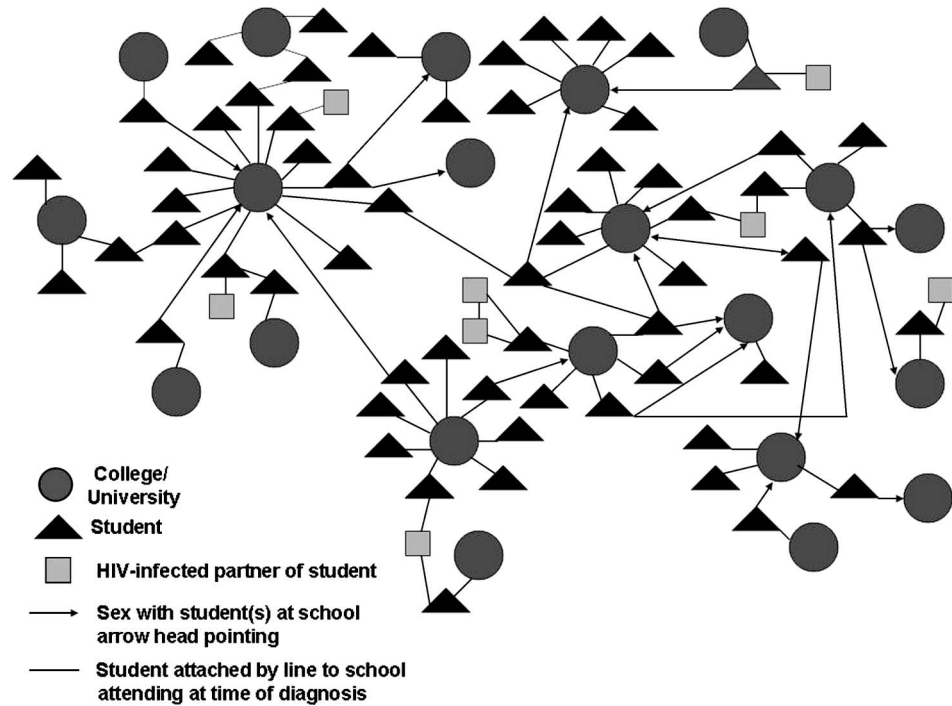


FIGURE 2. Sexual partner network investigation from January 2000 to December 2003 in 69 North Carolina counties.

DISCUSSION

We have described a previously unrecognized epidemic of HIV infection that is primarily affecting young African American MSM and MSM/W attending college in North Carolina. In addition, our data demonstrate that the sexual networks of these students are complex and expansive, extending into 5 other states in the southeastern United States. Cases of HIV infection in North Carolina college students have been rapidly increasing in number as well as in percent of the total cases among men aged 18–30 years since the last half of 2001. College students have not previously been recognized as a group for emerging HIV infection. The only previous study was published in 1990 and found rates of HIV infection in students attending 19 colleges and universities (only 1 of which was located in the southeastern United States) to be lower than rates in the general population.⁷

In this investigation we found a trend for increasing rates of HIV infection among African American men attending all colleges and universities in North Carolina. Although these rates were lower than rates for African American men of the same age group, we did find alarmingly high rates of HIV infection on some individual campuses. This finding warrants further investigation as high HIV prevalence in small sexual networks can have a significant impact on transmission.^{24,25}

Several noteworthy differences in risk behaviors between CM and non-CM with newly diagnosed HIV infection were revealed. The college students identified with newly diagnosed HIV infection were more likely than non-CM to visit bars or dance clubs and to use ecstasy or other club drugs. Of note, college students were also more likely to meet sex partners over the Internet. Previous research has found that Internet sex seekers were more likely to be MSM²⁶ and to

report higher rates of high-risk sexual behaviors,^{27,28} more previous sexually transmitted diseases, and more sexual partners.^{26,29,30} Future studies will need to explore whether and how cyberspace may be contributing to expanding sexual networks and a rise in HIV infection in young MSM. Additionally, the finding that college students are meeting sex partners at bars and clubs and over the Internet is an important risk association that could have a significant effect on future prevention and outreach activities.

North Carolina has established a novel approach for the identification of acute HIV infection. The finding that college students were more likely to be diagnosed with acute or recent

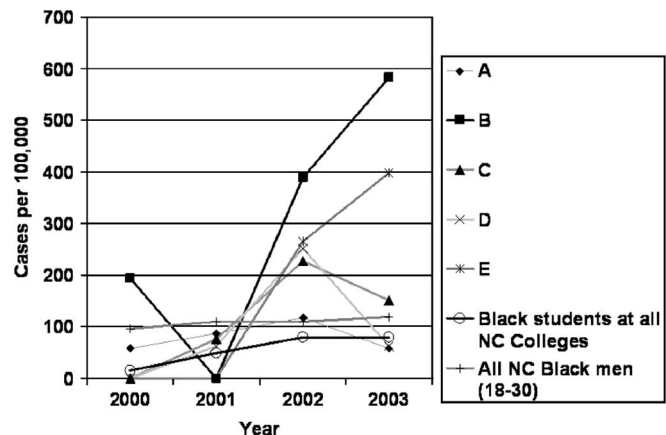


FIGURE 3. New HIV infection rates among black men, aged 18–30, at 5 North Carolina colleges/universities, 2000–2003.

HIV infection is noteworthy. It has been previously documented that acute HIV infection is associated with high HIV viral loads and that HIV is readily transmitted by sexual intercourse during early acute HIV infection.³¹ It has been estimated that as much as half of HIV transmission may occur during the acute infection interval.^{32,33} This may explain, in part, the rapid increase in newly reported HIV within an existing sexual network of college MSM.

This investigation was limited to the study of HIV-infected men in North Carolina; however, we found that 40% of the HIV-infected male students reported having female sexual contacts in the year prior to their diagnosis. Therefore, there appears to be a genuine potential for spread of HIV infection from male college students to their female partners as well as to the heterosexual college community. Reports have varied on the role that male bisexual behavior may play in driving the heterosexual spread of HIV.^{34–38} These studies have focused on bisexual behavior in urban areas and it is unclear whether these past studies can be generalized to the North Carolina population, which is half rural (US Census 2000). Previous work has reported that bisexuality may be more prevalent in communities of color because the open expression of homosexuality is limited due to narrowly defined gender roles and community norms.^{34,36,39} Individuals may identify themselves in public and in private as heterosexual but engage in sexual relations with both men and women.^{36,40} A better understanding of how students, especially minority students, deal with issues related to sexual orientation, identification, and behavior is needed.

Despite findings that college students have high levels of knowledge about the transmission of HIV, this knowledge does not always lead to HIV preventative behavior.^{15,19–21,41} College students have been found to perceive a low personal risk for HIV and to have confidence in their ability to choose uninfected sex partners.^{42–44} In one study, students continued to engage in unprotected sex with multiple sex partners despite accurately recognizing themselves to be at higher risk.⁴⁵ A sample of male college students seeking treatment of STDs in one student health center perceived themselves to be at “extremely low risk” for HIV despite engaging in high-risk behaviors and having a previous diagnosis of an STD.⁴⁶ Interventions that strive to increase perceived susceptibility to HIV need to be incorporated into successful prevention campaigns, especially in the college student population.

Most of the HIV-infected students in this investigation were African American. It has been suggested that there are significant gaps in the provision of HIV prevention programs to minority students⁴⁷ and a better understanding of the barriers to HIV education among select student groups is needed.⁴⁸ Risk factors may be specific to African American students such as the sex-ratio imbalance of African American women to men on college campuses.⁴⁹ Focus groups with African American men and women conducted in North Carolina suggested that the shortage of African American men influenced both genders’ participation in risky sexual behaviors.⁵⁰ One study found that the predominance of same-race partnerships among African Americans tends to confine STDs within their social networks.⁵¹ Compared with sequential monogamous relationships, concurrent sexual

partnerships (sexual relationships that overlap in time) permit rapid spread of STDs.^{25,52,53} Some studies have found that concurrent partnerships are more common among African Americans than whites or other races.^{54–56}

The findings in this study are subject to several limitations. Since all of the information on new HIV infections in this investigation related to new diagnoses, it is possible that case reporting could be influenced by changes in provision or uptake of HIV testing in specific populations (eg, at campus testing sites). Underestimates of observed new HIV infection rates may have occurred because out-of-state students may undergo testing in, or have their diagnosis reported to, their state of legal residence, and not all infected students choose to have an HIV test and may be unaware of their serostatus. It is also possible that the number of new HIV diagnoses in both CM and non-CM in that last half of 2003 is an underestimate due to HIV reporting delays. In addition, the retrospective nature of this study limited our ability to validate an interviewees’ responses with the DIS during their interview(s) and also limited our ability to perform a matched case-control study of HIV-uninfected college students over the period in question.

In response to the findings reported here, the North Carolina STD/HIV Prevention and Care Branch has initiated an interactive dialogue with the individual colleges and universities and their associated student health facilities and county health departments. The formation of these partnerships has led to expanding the capacity for free HIV testing at all 16 public universities and many of the involved private colleges as well. Focus groups with students and interviews with cases have fostered more directed prevention messages aimed at decreasing HIV transmission within the African American MSM and MSM/W college student population. Peer education programs have been initiated at high schools with HIV incidence rates. Attempts to reach students at off-campus sites include periodic HIV outreach education and testing at the clubs identified in the investigation as part of the sexual partner network, as well as partnership with 2 local county syphilis elimination programs for the establishment of new community condom distribution and nontraditional HIV testing sites.

College students have not traditionally been seen as a risk group for HIV infection. This oversight may be related to the assumption that knowledge of HIV and AIDS, and avoidance of HIV risk, are positively correlated with educational attainment, an assumption that is not always accurate.^{57–60} Results from this investigation indicate that there is a pressing need to better understand factors unique to HIV transmission among college students, specifically African American MSM and MSM/W. We have a unique opportunity as well as a critical obligation to design and implement prevention interventions to limit the further spread of this epidemic.

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