Identifying People with Acute HIV Infection (AHI) – Demographic Features, Risk Factors, and Use of Health Care among Individuals with AHI in North Carolina

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Abstract

Identifying and counseling individuals with Acute HIV Infection (AHI) offers a critical opportunity to avert preventable HIV transmission, however opportunities to recognize these individuals may be missed. We surveyed 32 adults diagnosed with AHI during voluntary HIV testing from 1/1/03 to 2/28/05 in publicly funded testing sites in NC to describe their clinical, social, and behavioral characteristics. Eighty-one percent of participants were men; 59% were African American. Seventy-five percent experienced symptoms consistent with acute retroviral syndrome; although 83% sought medical care for these symptoms, only 15% were appropriately diagnosed at that initial medical visit, suggesting opportunities to diagnose these individuals earlier were missed. Eighty-five percent of the men engaged in sex with men. More than 50% of the participants thought they were infected with HIV by a steady partner. This study yields important information to assist in identifying populations at risk for or infected with AHI and designing both primary and secondary prevention interventions.

Keywords

Acute HIV Infection (AHI); North Carolina (NC); HIV/AHI screening; AHI Epidemiology; HIV Risk Factors

Introduction

Despite ongoing human immunodeficiency virus (HIV) treatment and prevention efforts, the HIV incidence in the United States (US) in 2006 was estimated at 56,300 new infections (Hall et al., 2008). Efforts to stem the US epidemic have been hindered, partly by difficulties

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accurately identifying and understanding populations at highest risk of transmitting HIV, such as those with acute HIV Infection (AHI) (Weintrob et al., 2003).

AHI, the period from initial transmission until HIV antibodies develop (approximately 22 days after infection) (Fiebig et al., 2003; Lindback et al., 2000), is the most infectious stage of HIV (Hollingsworth, Anderson and Fraser, 2008; Jacquez et al., 1994; Leynaert, Downs and de Vincenzi, 1998; Pilcher et al., 2004; Wawer et al., 2005) because HIV viral replication and shedding peak during this time, resulting in extremely high viral loads (sometimes >1,000,000 copies/ml) (Quinn, 1997; Schacker et al., 1996; Schacker et al., 1998). There are estimates that 43% of all new HIV infections in the US may be transmitted by persons with AHI (Wawer et al., 2005). This is particularly concerning because people with AHI may be engaging in the same high-risk sexual behaviors that led to their recent acquisition of HIV, particularly if they do not yet know they are infected. (Colfax et al., 2002; Hecht et al., 2002; Jacquez et al., 1994; Koopman et al., 1997; Patel et al., 2006; Pilcher et al., 2001; Pilcher et al., 2004). Identifying and counseling individuals with AHI offers a critical opportunity to avert a significant number of HIV transmission events (Koopman et al., 1997; Patel et al., 2006; Pilcher et al., 2005; Pilcher et al., 2001), however little is known about these individuals to inform the development of prevention interventions for people in this stage of infection. Because diagnosis of AHI usually depends upon the clinical recognition of acute retroviral syndrome (ARS) (Kahn and Walker, 1998), which is characterized by non-specific symptoms (Hecht et al., 2002; Schacker, 1996), it is rarely diagnosed, which significantly hinders entry into care and assessment of AHI (Bollinger et al., 1997; Kahn and Walker, 1998; Schacker et al., 1996; Vanhems et al., 1997). However, in 2002, the state of North Carolina (NC) began universal screening for AHI, testing all HIV-antibody negative specimens submitted for voluntary HIV testing at any publicly-funded testing site in NC, using a cost-effective screening system (Daar et al., 2001; Pilcher et al., 2005; Pincus et al., 2003). To gain an understanding of the health care seeking behaviors, risk perceptions and transmission risk behaviors of people with AHI, we assessed the demographic characteristics, HIV testing histories, risk perceptions, behaviors and health care access of 32 people diagnosed with AHI using this system in NC. We compared these factors among this group by gender and sexual orientation. Our ultimate goal in understanding factors associated with AHI is to promote recognition of early HIV infection so that care and prevention services-including partner services and risk reduction counseling may be provided.

Methods

Study Design

We conducted a cross-sectional observational interview study from September 1, 2003 to March 31, 2005 to characterize individuals diagnosed with AHI during routine HIV testing between January 1, 2003 and February 28, 2005.

Study Participant Identification

The NC Department of Health and Human Services (DHHS) HIV/STD Prevention and Care Branch's current Screening and Tracing for Active HIV Transmission (STAT) Program screens all specimens with a negative or intermediate antibody test for AHI by nucleic acid amplification tests (NAAT). The STAT Program uses an algorithm that pools specimens into groups of nine which are then pooled into 10 groups of nine enabling 90 specimens at a time to be screened by one NAAT (methods more fully described elsewhere) (Pilcher et al., 2005). At the time of HIV test results delivery, clinical staff asked permission of all those who were AHI positive to be contacted regarding potential study participation. Eligibility criteria for the study reported here were as follows: at least 18 years of age, proficient in English, a positive

pooled NAAT test after an initial negative HIV antibody test, and consent to be contacted for an interview.

Study Procedures/Measures

All eligible participants were interviewed for approximately 60 minutes face-to-face by trained study staff, using a standardized questionnaire that included closed and open-ended questions developed by researchers from the University of North Carolina. We collected information on the following topic areas: demographic characteristics, HIV-testing history, lifetime HIV risk factors, risk behavior during the year prior to HIV diagnosis, health care access, use of health services, health care delivery, and any symptoms of acute illness consistent with ARS. Written informed consent for participation was obtained at the time of the interview.

Data Analyses

De-identified data from the interviews were entered into a secure database for analysis. A quality control investigator confirmed accurate data entry. We conducted comparative statistics to assess differences between the demographic characteristics of persons diagnosed with AHI during the study period that did participate and did not participate. Descriptive, univariate statistics, as well as comparative analyses assessing differences in age and number of sexual partners by gender and self-reported sexual identity, were generated using statistical software STATA version 9.2. For highly skewed data, medians were reported. Participants were excluded from analyses for which they had information missing. Regarding sexual orientation, all participants were included in the group to which they self-identified. The group referred to as "MSM" included all men who had at least one male sexual partner in the previous year regardless of sexual orientation. Each analysis either specifies sexual orientation (gay, heterosexual, bisexual) or reported sexual behavior (MSM). Differences of statistical significance were not examined among the subgroup characteristics of gender, age, race, or sexual orientation due to the small sample size resulting in inadequate power to detect true differences.

Results

Study Participants

Seventy-nine people were diagnosed with AHI HIV between January 1, 2003 and February 28, 2005 (see Figure 1). Of these, 26 people declined to be contacted for an interview and 17 could not be located by study staff. Of the remaining 36 participants, 32 met the eligibility criteria. General demographic characteristics were not statistically significant between those who agreed to participate in the study and those who refused or could not be located. Reasons for declining participation included concerns about confidentiality (n=5), not wanting to talk about their diagnosis (n=2), not interested in study participation (n=6) and no reason given (n=13). All interviews took place within 12 months of AHI diagnosis (Median = 61 days, Range = 10–365 days).

Demographic Characteristics

Demographic features of the study participants are displayed in Table 1. Of note, 81% were men, 59% African American, mean age was 29 with a much narrower age range for women (21–28 years) compared with men (19–63 years).

Sexual Identity and Gender of Sexual Partners

All women (n=6) identified as heterosexual and reported only male sexual partners (see Table I). Twenty-two men (85%) reported having male sexual partners, and 42% reported having female sexual partners in their lifetime. Of the six men who identified as heterosexual, all had

female sexual partners, and two also reported at least one male sexual partner in his lifetime. Of the seven men who identified as bisexual, all reported having had male sexual partners and five reported having had female sexual partners. None of the 13 men who identified as gay reported having any lifetime female partners.

Number of Sexual Partners and HIV Transmission Risk Behaviors

The median number of lifetime sexual partners of all participants was 20 (range, 1–1,000). Heterosexual men had a median of 20 partners (range, 1–72 partners), bisexual men 12 partners (range, 1–54 partners), and gay men 50 partners (range, 2-1,000 partners) (see Table I).

The median number of sexual partners in the year prior to diagnosis for all participants was six (range, 1–100 partners) (see Table II). Among the men, heterosexual men had a median of two partners (range, 1–8 partners), bisexual men had a median of five partners (range, 1–8 partners), and gay men had a median of 22 partners (range, 3–100 partners) in the year prior to being diagnosed with AHI. In the year prior to diagnosis, women had a median of one partner (range, 1–8).

In the year before diagnosis, no heterosexually-identified men reported engaging in any acts of insertive anal sex with another man or with a woman, but 2 reported receptive (1 unprotected) anal sex, and 4 reported unprotected vaginal sex. In their pre-diagnosis year, 85% of the gay-identified men reported unprotected receptive anal sex with a steady male partner and 62% reported unprotected insertive anal sex with a steady male partner. Almost half of the gay-identified men (n=6) reported unprotected insertive and unprotected receptive anal sex. None of the women and only 8% of the men reported having protected oral sex. No one reported using injection drugs in the year before AHI diagnosis.

Perception of Risk

When asked to describe what their perceptions had been of their risk of contracting HIV during the year before receiving their AHI diagnosis, 78% of participants reported that they had perceived their risk to have been "unlikely" or "very unlikely". Six percent had believed, during that year before infection, that their risk of HIV infection was "likely". A majority of the participants (53% of the total; 83% of women, 57% of MSM, 17% of heterosexual men) thought that they acquired their HIV infection from a steady partner, (defined as someone they had known for more than two months, who they had an emotional bond with, and with whom they had regular sex, such as a boyfriend, spouse, significant other or life partner). More than half (n=17) of the sample reported that before they were diagnosed with HIV, they had thought the chances their *steady* partner could have been infected with an STI (Sexually Transmitted Infection) or HIV was "unlikely" or "very unlikely". In contrast, when asked about their thoughts regarding their *casual* partners before diagnosis, only 30% (n=7) felt their casual partners were "unlikely" or "very unlikely" to have an STI or HIV among individuals (n=23) reporting causal partners.

Lifetime History of Sexually Transmitted Infections

One quarter of the study participants (n = 8) reported a history of *Neisseria gonorrhoeae* during their lifetime. In the past, five participants (16%) had been diagnosed with *Chlamydia trachomatis*, five (16%) with hepatitis B, and four (13%) with syphilis.

Lifetime History of HIV Testing (Table III) and Reasons for Testing

Overall, more than one third of the study participants (38%) had tested 5 or more times for HIV infection (see Table IV). Only four people (12%) reported that their positive AHI test was their first HIV test. About half (54%) of the gay-identified men reported testing for HIV at

least every 6 months, compared to 43% of the bisexual men, 33% of heterosexual men and 17% of women.

Most individuals (78%) reported multiple reasons for seeking testing at the time of their positive AHI diagnosis (see Table IV), with the majority reporting being tested because they "had unprotected anal sex with a man" (56%), and/or because they "wanted the reassurance that they were HIV negative" (56%). Ten people (31%) had an HIV test because they felt sick at that time. Only six participants (19%) reported ever hearing at all about AHI before their diagnosis.

Acute Retroviral Syndrome and Medical Evaluation

Three quarters of participants (n = 24) reported feeling ill some time during the three months before their positive test for AHI. Twenty had sought medical attention for their illness. The reasons that four people did not seek medical attention despite having ARS symptoms included: the cost of medical care or lack of insurance (n=3); the symptoms were not severe enough to warrant seeking medical care (n=3); and/or the symptoms resolved on their own (n=2).

Of the 24 individuals who experienced ARS symptoms, the most commonly reported symptoms were fever (80%), loss of appetite/weight loss (76%), gastrointestinal upset (68%), sore throat (64%). and skin rashes (31%).

Of the 20 people who sought medical care for ARS-like symptoms in the three months prior to their AHI diagnosis, 12 people (60%) sought care in an emergency department or urgent care, six people sought care from a primary care provider, one in a student health clinic and one at an infectious disease clinic.

Ten of those who sought medical care were diagnosed with a viral syndrome (such as an upper respiratory infection, hepatitis, influenza, and gastroenteritis). Five were diagnosed with bacterial infections (such as streptococcal pharyngitis, Rocky Mountain Spotted Fever, and pneumonia), one person was told that he was experiencing a stress reaction and another was evaluated for a myocardial infarction. Three individuals were accurately diagnosed with AHI at their initial sick visit. Seven individuals were prescribed unnecessary antibiotics. Of the 17 misdiagnosed individuals, none were tested for HIV at their initial visit, nine sought later testing at either an HIV counseling and testing site or an STD (Sexually Transmitted Disease) clinic, seven were tested during subsequent medical evaluation at either a hospital, specialty clinic or their primary provider, and one was tested by State Partner Counseling and Referral Officers due to being named as a contact of a HIV positive partner.

Discussion

In this study, we identified several areas of missed opportunities in the care of individuals with AHI, which, if improved upon, could reduce HIV transmission domestically. First, although participants reported risky activities, high rates of previous STI infections, and relatively high rates of HIV testing, few perceived themselves to be at high risk of acquiring HIV during the period when they acquired it. Furthermore, few were aware of AHI or that ARS symptoms could suggest an HIV infection. The vast majority of persons with AHI in NC were relatively young MSM. Taken together, our findings suggest that while educating young MSM about their actual risks of HIV acquisition is a critical first step, providing additional guidance around HIV testing frequency and supporting more programs that reinforce peer norms around condom use may be needed. Second, a majority of persons with AHI sought medical care for symptoms of ARS but were misdiagnosed. Thus, programs are critically needed to increase awareness of AHI among providers, especially those caring for MSM. Additionally, community and patient education programs focusing on ARS symptoms could help to increase awareness of the need

for HIV testing at the time of symptoms among vulnerable populations. Finally, a substantial minority of persons with AHI symptoms did not seek medical attention, some due to the cost of care, suggesting that inability to pay for medical care may hinder health care and public health practitioners' capacity to identify individuals with AHI.

In this study the percentage of people identified with AHI who were MSM (85%) was nearly double the percentage of MSM (46% and 49%) diagnosed with any stage of HIV in similar years in NC and as reported by the CDC, respectively (NC HIV Surveillance Report, 2007; CDC, 2007). Two of the heterosexually identified men in this study, both of whom were young, college educated African Americans, reported having sex with other men and suspecting that their steady male partner had transmitted HIV to them. These findings are consistent with other studies indicating that substantial proportions of heterosexually identified Black men report having sex with men (Doll et al., 1992; Goldbaum et al., 1998; McKirnan et al., 2001; Millett et al., 2005; Ross et al., 2003; Wohl et al., 2002) and are less likely to disclose their sexual orientation or behaviors (CDC, 2003b; Kennamer et al., 2000; Ostrow et al., 1991). These findings also support the notion that patients and providers need to discuss the patient's sexual activities and perceptions of HIV acquisition risk.

The lack of women identified with AHI in this study, a trend frequently seen in other AHI studies (Celum et al., 2001; Hecht et al., 2002; Pao et al., 2005; Patel et al., 2006; Pilcher et al., 2005; Pincus et al., 2003; Sabundayo et al., 2006; Schacker et al., 1996; Weintrob et al., 2003) could be confounded by women receiving less testing than men, which could be due to either less HIV testing or providers routinely offering it less to women (Siegel, Karus and Raveis, 1997). In our study all of the women had received health care in the year prior to their diagnosis (median, 5 times (range 2–20)), but none reported being asked about or given advice regarding HIV prevention and/or testing. Again, these findings suggest the need to educate providers to ask female patients about risk factors for HIV and to be more poised to encourage testing women for HIV.

Unprotected oral-genital contact, which has been shown to less efficiently transmit HIV, was more frequent in our study participants known to have just acquired HIV than unprotected anal-genital contact (Kingsley et al., 1987). Other studies have shown similar findings (Schacker et al., 1996; Schwarcz et al., 1995) and suggest that the rates of transmission for oral genital contact may be higher than originally suspected. While such findings may reflect underreporting of improper condom use during non-oral sex, another potential missed opportunity may be to direct increased attention to oral-genital contact as a risk factor for HIV (Schacker et al., 1996 Velum et al., 2001).

This study has some limitations. The cross-sectional design limits our ability to determine temporality and thus to address causality. However, because little is known about those who have AHI, descriptive prevalence studies that attempt to test the universe of patients diagnosed with AHI are informative and useful. Second, the fact that the majority of men in this study identified as either gay or bisexual may reflect a detection bias as they tested for HIV more often than men who have sex with women only. Third, because of our use of self-reported information and that the diagnosis of HIV preceded the interview, recall bias may have affected participants' perceptions of their risk behaviors prior to diagnosis (Pao et al., 2005). Fourth, the power to detect statistically significant differences was limited in our study due to the small sample size. A strength of this study is that, rather than using a convenience sample as has been implemented in most other AHI studies, we were able to identify all the AHI diagnosed in one state in a given time period and interview all those who could be located and agreed to participate. While our findings are useful in similar settings, they may not be generalizable to other states or regions that may have different demographic characteristics.

Throughout the history of the AIDS epidemic, it has often proven difficult to identify these high-risk groups until an outbreak is well underway. It is our hope that this research might reduce the number of missed opportunities by better facilitating early diagnosis (Cates, Chesney and Cohen, 1997; CDC, 2004; Koopman et al., 1997), therapeutic intervention, and behavioral counseling during AHI (Colfax et al., 2002; Schacker et al., 1996). An early and accurate assessment and diagnosis of AHI could eliminate much of the extensive clinical evaluation of serological tests, blood cultures, imaging studies, and hospitalization that individuals with ARS often go through before arriving at the correct diagnosis (Weintrob et al., 2003). Public health programs may be able to decrease the infectiousness of individuals with AHI through the timely initiation of antiretroviral therapy, which can control genital tract shedding and decrease the level of plasma viremia during acute infection (Pilcher et al., 2001; Yerly et al., 2001).

Acknowledgments

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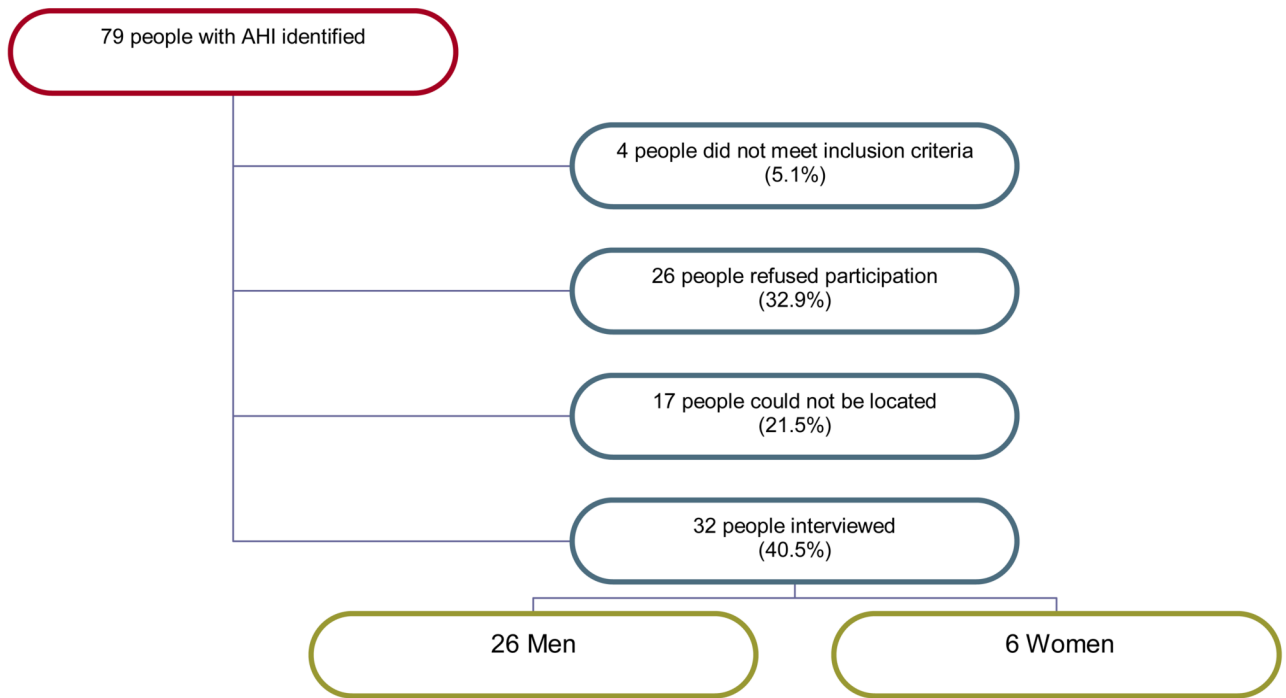
Figure 1.
Selection of Study Participants from All People Identified with Acute HIV Infection (AHI) at
All Publicly-Funded Testing Sites in NC Diagnosed Between 1/1/03–2/28/05

Table I

Characteristics of People with Acute HIV Infection in NC Diagnosed Between 1/1/03–2/28/05

Characteristics	Total No.	Women	All men	Men		
				Heterosexual	Bisexual	Homosexual
	n=32 (%)	n=6	n=26	n=6	n=7	n=13
Age, mean years [SD] (range)	29 [12] (19–63)	27 [6] (21–28)	30 [13] (19–63)	38 [20] (19–62)	22 [2] (19–25)	30 [10] (19–51)
Race/Ethnicity						
African American	19 (59%)	4	15	4	7	4
White	9 (28%)	2	7	1	0	6
Latino	2 (6%)	0	2	0	0	2
Other	2 (6%)	0	2	1	0	1
Relationship status						
Married	3 (9%)	1	2	2	0	0
Single & never been married	20 (62%)	3	17	2	5	10
Long-term relationship with a partner	5 (16%)	1	4	1	1	2
Divorced	3 (9%)	1	2	1	0	1
Education						
Less than high school	5 (16%)	2	3	1	0	2
High school or obtained equivalency	10 (31%)	2	8	3	2	3
Some college or technical trade school	11 (34%)	1	10	2	5	3
4 year college degree	3 (9%)	1	2	0	0	2
Graduate or professional school	3 (9%)	0	3	0	0	3
Employed	23 (72%)	2	21	5	6	10
Has male sexual partners	28 (87%)	6	22	2	7	13
Has female sexual partners	11 (34%)	0	11	6	5	0
No. of lifetime sexual partners, [median], (range)	[20] (1–1000)	[9] (1–19)	[31] (1–1000)	[20] (1–72)	[12] (1–54)	[50] (2–1000)
No. of sexual partners in yr prior to AHI diagnosis, [median], (range)	[6] (1–100)	[1] (1–8)	[7] (1–100)	[2] (1–8)	[5] (1–8)	[22] (3–100)
Any health care coverage in year prior to HIV positive test	22 (69%)	4	18	5	3	10
Private health insurance plan from employer or workplace	13 (59%)	3	10	2	1	7
Private health insurance plan purchased directly	1 (3%)	0	1	1	0	0
Medicare	1 (3%)	1	0	0	0	0
Medicaid/medical assistance/other state program	3 (9%)	2	1	1	0	0
On parents insurance plan	7 (22%)	0	7	2	2	3

Table II

HIV Risk Factors in Year Prior to HIV Diagnosis by Gender and Sexual Orientation of People with Acute HIV Infection in NC Diagnosed Between 1/1/03–2/28/05

Risk Factor	Women n=6 (%)	Men All men n=26 (%)	Heterosexual n=6	Bisexual n=7	Homosexual n=13
Intravenous drug use (IVDU)	0	0	0	0	0
With a steady female partner					
Oral sex	0	4 (15%)	3	1	0
Protected vaginal sex	NA	4 (15%)	2	2	0
Unprotected vaginal sex	NA	6 (23%)	4	2	0
Protected or unprotected anal sex	NA	0	0	0	0
With a casual female partner					
Oral sex	0	3 (12%)	2	1	0
Protected vaginal sex	NA	3 (12%)	2	1	0
Unprotected vaginal sex	NA	3 (12%)	3	0	0
Protected or unprotected anal sex	NA	0	0	0	0
With a steady male partner					
Protected oral sex	0	2 (8%)	0	2	0
Unprotected oral sex	5 (83%)	20 (77%)	2	5	13
Protected vaginal sex	2 (33%)	NA	NA	NA	NA
Unprotected vaginal sex	4 (67%)	NA	NA	NA	NA
Protected receptive anal sex	0	15 (58%)	2	4	9
Unprotected receptive anal sex	1 (17%)	16 (62%)	1	4	11
Protected insertive anal sex	NA	12 (46%)	0	4	8
Unprotected insertive anal sex	NA	12 (46%)	0	4	8
With a casual male partner					
Protected oral sex	0	3 (12%)	0	3	0
Unprotected oral sex	2 (33%)	16 (62%)	2	4	10
Protected receptive anal sex	0	15 (58%)	2	4	9
Unprotected receptive anal sex	0	10 (38%)	1	3	6
Protected insertive anal sex	NA	11 (42%)	0	3	8
Unprotected insertive anal sex	NA	9 (35%)	0	3	6

Table III

Number and Pattern of Lifetime HIV Testing by Demographic Characteristics of People with Acute HIV Infection in NC Diagnosed Between 1/1/03–2/28/05

	Lifetime Number of Tests					Pattern of Testing				
	Once	Twice	3–4 tests	5–10 tests	>10 tests	Every 3 months	Every 6 months	Yearly	<Once per year	Other[a]
All (n=32)	4	5	11	8	4	2	11	8	2	9
Race										
Black (n=19)	2	4	8	4	1	0	6	5	1	7
White (n=9)	1	1	2	3	2	1	4	2	1	1
Other (n=4)	1	0	1	1	1	1	1	1	0	1
Gender										
Male (n=26)	4	4	9	5	4	2	10	7	2	5
Female (n=6)	0	1	2	3	0	0	1	1	0	4
Sexual Identity Reported by Male Participants										
Heterosexual (n=6)	3	1	1	1	0	0	2	4	0	0
Bisexual (n=7)	0	2	4	0	1	0	3	1	1	2
Gay (n=13)	1	1	4	4	3	2	5	2	1	3

[a] Other includes: Pregnancy (3), based on start or end of relationships (3), no specific pattern (3)

Table IV

Reported Reasons for Voluntarily Seeking an HIV Test of People with Acute HIV Infection in NC Diagnosed Between 1/1/03–2/28/05[a]

Reasons for HIV testing at time of + test	Number of people (%) (n=32)
Wanted Reassurance, Make Sure You Were Negative	18 (56%)
Had Unprotected Anal Sex With a Man	18 (56%)
Symptoms of Acute Retroviral Syndrome (ARS)	10 (31%)
Part of a Routine Physical Examination or Medical Check-Up	8 (25%)
Sex Partner is HIV-Positive	5 (16%)
Symptoms of Other STI	5 (16%)
Sex Partner Asked You To	4 (12%)
Had Unprotected Vaginal Sex with a Woman (n=26)	3 (9%)
Routine Practice	3 (9%)
Sex Partner may be HIV-Positive	2 (6%)
Pregnancy	1 (3%)
Undefined High-Risk Exposure	1 (3%)
Contacted By DIS[b] Regarding Exposure	1 (3%)
Shared Needles or Syringes	0
Any Other Reasons	24 (75%)

[a] Reasons for seeking an HIV test were not mutually exclusive. Most participants gave more than one reason for testing and so individuals are represented several times in the table.

[b] Disease Intervention Specialists (DIS) contact people who have been reported as exposed to HIV by someone newly diagnosed with the disease.