

Anal Intercourse and HIV Risk Among Low-Income Heterosexual Women: Findings from Chicago HIV Behavioral Surveillance

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Abstract: *Background:* Anal intercourse (AI) is a highly efficient route for HIV transmission and has not been well elucidated among heterosexual (HET) women. Heterosexual women living in impoverished urban areas in the US are at increased risk for HIV acquisition. We aim to describe rates of AI and characteristics associated with AI among heterosexual women at increased risk for HIV acquisition living in Chicago.

Methods: The Chicago Department of Public Health conducted a survey of HET during 2007 as part of the National HIV Behavioral Surveillance System. Venue-based, time-location sampling was used to select participants from venues in high-risk areas (census tracts with concurrently high rates of heterosexual AIDS and household poverty). Eligible participants were interviewed anonymously and offered a HIV test.

Results: In total, 407 heterosexual women were interviewed. Seventy-one (17%) women reported having AI in the past 12 months, with 61 of the 71 (86%) reporting unprotected AI. In multivariate analysis, women who engaged in AI were more than three times as likely to have three or more sex partners in the past 12 months (OR=3.27, 95% CI 1.53-6.99). AI was also independently associated with STI diagnosis in the past 12 months (2.13, 95% CI 1.06-4.26), and having sexual intercourse for the first time before the age of 15 years (2.23, 95% CI 1.28-3.89).

Conclusion: AI was associated with multiple high risk behaviors including a greater number of sexual partners, STI diagnosis, and earlier age at first sex. The combination of risk factors found to be associated with AI call for new HIV prevention services tailored to the needs of women and young girls living in poverty.

Keywords: HIV/AIDS, heterosexual, anal intercourse, women, behavioral surveillance.

INTRODUCTION

Human Immunodeficiency Virus (HIV) prevalence among heterosexuals living in high-poverty urban areas in the United States (U.S.) has recently been described by the Centers for Disease Control and Prevention (CDC) as a generalized epidemic [1]. Heterosexual women are more heavily impacted by HIV infection than heterosexual men. In 2008, women accounted for 66% of heterosexual HIV diagnoses in the U.S., and 76% of heterosexual HIV diagnoses in Chicago [2, 3].

Anal intercourse (AI) is often overlooked as a risk factor for HIV acquisition among heterosexuals, yet a substantial proportion of heterosexual women report participating in AI in their lifetime. Approximately 34% of women from a national probability sample aged 20-44 reported ever having AI [4], and it is estimated that approximately 9% of women in the general population have practiced AI in the past 12 months [5].

AI is a highly efficient route for HIV transmission. The estimated risk per act for acquiring HIV is 5 times greater for participation in receptive AI compared with receptive vaginal intercourse [6]. Additionally, condom use is reported

less frequently with anal intercourse than it is with vaginal intercourse [7].

Several studies have examined factors associated with heterosexual AI. However, much of the focus has been on women recruited from injection drug using (IDU), or sexually transmitted infection (STI) clinic populations. Among women attending public STI clinics, AI has been associated with exchanging sex for money or drugs [8, 9], substance use [9], sex on the same day as meeting a partner [9], having more than three sex partners in one's lifetime [9], and non African-American race/ethnicity [9]. Among female IDUs, AI has been associated with exchange sex [10, 11], bisexuality [10], amphetamine use [11], and sex with partners who were non-heterosexual or injection drug users [10].

The proportion of people living with AIDS in the U.S. is increasing among women and among the poor [12]. A study by Peterman *et al.* found that the counties in the U.S. with the largest increases in incident AIDS cases had higher proportions of low-income households and substandard social conditions than the counties in the U.S. with the smallest increases in incident AIDS cases [13].

The noted increase in AIDS cases among women living in poverty underscores the need for an understanding of the HIV risk factor dynamics in this group. Previous research has only assessed factors associated with AI among specific subgroups of heterosexual women. Little is known about factors related to AI among this particularly vulnerable group in Chicago. The aim of this paper, therefore, is to

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describe rates of AI and characteristics of heterosexual women who engage in AI, among a representative sample of women living in low-income areas of Chicago.

MATERIALS AND METHODS

Study Design

The Chicago Department of Public Health conducted a survey of heterosexual males and females between March and October of 2007 as part of the National HIV Behavioral Surveillance system (NHBS). NHBS is an ongoing CDC funded project that collects cross-sectional data on HIV/STI risk behaviors, HIV testing behaviors, and exposure to HIV prevention in populations that are at-risk for HIV infection. NHBS is conducted in 21 cities in three populations: Men Who Have Sex With Men (MSM), Injection Drug Users (IDU), and Heterosexuals living in High Risk Areas (HET). Surveys are conducted annually, and repeated in three year cycles. Participants were eligible if they were between 18 and 50 years of age, residents of Chicago's metropolitan statistical area, and if they reported vaginal or anal intercourse with a member of the opposite sex in the past 12 months.

The National Center for HIV, STD, and TB Prevention (NCHSTP), CDC, has determined that NHBS is a public health surveillance activity, used for disease control program or policy purposes and is not considered to be research. Therefore, the CDC Human Subjects Protection Office made a determination that the CDC was "not engaged" in the research and thus NHBS protocol did not require CDC IRB review. All local human subject research activities were approved by the Chicago Department of Public Health Institutional Review Board. Verbal consent was secured and recorded from each research participant for the survey component. Standard written consent was used for the HIV testing component.

Sampling Methods

Venue-based, time-location sampling (VBS) was used to select participants from venues in high-risk areas (HRAs) of Chicago. VBS is a three stage process. First, formative research is conducted to identify potential venues for sampling and learn about the sample population. The second stage involves creating a sampling frame which includes venues and the venue day-time periods (VDT) when it is possible to conduct sampling. Venues and VDTs are randomly selected in two stages to create monthly sampling calendars. The third stage of VBS entails randomly selecting and interviewing participants within the venues [14].

Formative research was conducted between February 2006 and February 2007. During formative research, HRAs were identified using CDC-NHBS protocol. HRAs are census tracts with high rates of AIDS cases attributed to heterosexual contact, and census tracts with high rates of poverty. Chicago 2004 AIDS Case surveillance data and 2000 U.S. census data were used to define these areas. Census tracts were ranked according to the areas with the highest rates of both AIDS and poverty. The top 15% (123) of ranked census tracts were chosen for investigation.

The 123 census tracts were observed noting population density, abundance of potential venues for recruitment,

pedestrian activity, sampling feasibility, and signs of gentrification. Gentrified census tracts were excluded from sampling.

A total of 15 geographically diverse census tracts were determined to be HRAs in Chicago. Respondents were sampled from 74 venues within these census tracts. The venues included convenience stores, laundromats, street corridors, beauty salons, churches, and other locations.

Heterosexuals attending venues were randomly approached and were asked if they were interested in participating and undergoing eligibility screening. Participants were administered an anonymous, face-to-face, standardized questionnaire using a hand-held computer. Eligible participants were also offered HIV testing using Orasure[®] testing technology (Orasure Technologies Inc, Bethlehem, PA, USA).

The sample size goal designated by the CDC was 750 participants. NHBS-Chicago recruited 851 eligible participants; 412 of which were women. Participants were compensated up to \$50 for the time and effort required for the questionnaire and HIV test.

Measures

The standardized questionnaire gathered data about respondents' sexual and drug-use behaviors, HIV and STI testing behaviors, and exposure to and utilization of HIV prevention services. All of the information obtained in the survey was self-reported.

Sexual Risk Behaviors

Participants were asked about their sexual behavior within the 12 months prior to the survey. They were asked about the types of partners they had, the types of sex they had with each partner type, whether or not condoms were used during sex, the number of sexual partners they had in the past 12 months, and the age at which they first initiated vaginal or anal intercourse. Three partner types were assessed in the survey: main, casual, and exchange. These partner types were defined as follows: "Main partners are partners you have sex with who you feel committed to above anyone else (includes girlfriend, wife, significant other or life partner); casual partners are partners you have sex with but do not feel committed to or don't know very well; and exchange partners are partners you have sex with in exchange for things like money or drugs".

Likewise, three types of sexual intercourse were assessed in the survey: oral, vaginal, and anal. The three types were defined as follows: "Oral sex means mouth on the vagina or penis; vaginal sex means penis in the vagina; and anal sex means penis in the anus or butt". Concurrency was measured by asking participants whether or not they had sex with "other people" during the time of their most recent sexual relationship.

Drug-Use Behaviors

Participants were asked whether or not they used any "non-injection" drugs that were not prescribed to them in the past 12 months. They were also asked about their participation in "binge drinking" in the past 12 months. "Binge drinking" for a female is defined as having 4 or more drinks in one sitting [15]. The frequency of binge drinking

was assessed by asking the female respondent, "In the past 12 months, how often did you have 4 or more alcoholic drinks in one sitting?"

HIV/STI Testing Behaviors and Exposure to HIV Prevention

To assess whether or not participants tested for HIV on a regular basis, the survey asked how many times participants had been tested for HIV in the previous two years. The survey also asked whether or not participants were exposed to and utilized HIV prevention services by asking if any of the following had occurred in the previous 12 months: they received any free condoms from someone other than a friend, relative, or sex partner, or they participated in any individual-level or group-level HIV interventions. Participants also reported whether they had been diagnosed with any STIs in the past 12 months.

Other Variables

Additional variables included in the analysis were: homelessness in the past 12 months, defined as: "living on the street, in a shelter, a Single Room Occupancy hotel (SRO), temporarily staying with friends or relatives, or living in a car," current employment status, estimated annual income (annual household income divided by the number of people dependent on the income), sexual identity (heterosexual, bisexual, or homosexual), and being arrested and detained for over 24 hours in the past 12 months.

Statistical Analysis

The outcome for analysis was receptive anal intercourse, defined as participation in AI with a partner of any type in the past 12 months. Data were limited to female participants who had no history of injection drug use in the past 12 months. Descriptive analysis was conducted using chi-square tests to determine differences between women who reported AI in the past 12 months with those who did not. Variables were then assessed by univariate logistic regression. Multivariable logistic regression using the stepwise procedure was performed in order to establish variables that were independently associated with AI. Variables significant at the $p \leq .1$ level in univariate analysis were entered in the multivariable model. To be retained in the final model, all variables had to be significant at the $p \leq .05$ level.

Categorical variables were dichotomized to the most relevant categories: less than high school education versus high school diploma/equivalent and higher, estimated annual income less than \$10,000 versus \$10,000 or more, sexual identity of heterosexual versus homosexual or bisexual, binge drinking once a month or more versus less than once a month, and exposure to either one-on-one HIV interventions, group HIV interventions, or having received free condoms in the past 12 months versus no exposure to any of the aforementioned.

Continuous variables were dichotomized to provide meaningful interpretations: 3 or more partners in the past 12 months versus less than 3, age at sexual initiation younger than 15 years versus 15 years or older, and regular HIV testers were defined as those who reported at least two HIV tests in the previous two years. Data were analyzed using Statistical Analysis Software version 9.2 (Cary, NC).

RESULTS

Between March and October of 2007, the Chicago NHBS HET team screened 1101 respondents, with 866 (79%) meeting the eligibility criteria. In total, 851 (98%) of the 866 consented to participate. Of the total 851, 412 (48%) were women. An additional five women were excluded from the analysis due to reporting injection drug use within the past 12 months. Among the 407 women included in analysis, 71 (17%) reported participating in anal intercourse in the past 12 months. Of the 71 women who reported AI in the past 12 months, 61 (86%) reported that it was unprotected. AI occurred most commonly with main partners (87%), and slightly less than a quarter (21%) of women who reported AI in the past 12 months reported that it was with a casual partner (Table 1).

A total of 381 (94%) of women consented to the HIV test; 7 (1.84%) tested HIV positive *via* Orasure[®] Western blot. HIV prevalence rates were similar among women who reported AI compared to those who did not report AI (1.52% vs 1.9%; Fisher's exact test $p=1.0$).

The mean age of participants was 31.7 years. The majority of women reported being Black/African-American (82%), had an estimated annual income less than \$10,000 (81%), and had at least a high school education or equivalent (66%). Approximately 15% were homeless in the past 12 months, and 11% had been arrested and detained for over 24 hours in the past 12 months (Table 1).

Almost all of the women in the sample reported unprotected vaginal intercourse in the past 12 months (87%). Approximately one-third of women reported being younger than 15 years old at first vaginal or anal intercourse (32%). About one-tenth of women reported three or more sexual partners in the past 12 months (11%), and less than ten percent reported exchange sex in the past 12 months (7%). Seven percent reported a sexual identity other than heterosexual.

Slightly less than a third of women reported having concurrent partners in the past 12 months (31%), and 15% reported being diagnosed with a STI in the past 12 months. Gonorrhea and Chlamydia were the most prevalent STIs, with 12% of women reporting being diagnosed with either infection in the past 12 months. Trichomoniasis was also common, with 4% of women reporting diagnosis in the past 12 months.

Only a third of women reported being tested for HIV on a regular basis (30%), and 88% had not been exposed to or utilized any HIV prevention services in the past 12 months. Almost half of all women in the sample reported using an illicit non-injection drug in the past 12 months (42%), and over a third reported binge drinking at least once a month in the past 12 months (38%) (Table 1).

Table 2 shows the factors associated with AI in univariate analysis. AI was positively associated with the following behaviors in the past 12 months: homelessness, being arrested and detained for over 24 hours, STI diagnosis in the past 12 months, illicit non-injection drug use, having three or more sexual partners in the past 12 months, and having any exchange sex.

Table 1. Demographic, Sexual, and Drug Use Behaviors of Heterosexual Women at Increased Risk in Chicago

	(#) (n= 407)	(%)
Had anal intercourse in the past 12 months	71	17
Had unprotected anal intercourse in the past 12 months	61	15
Had anal intercourse with a main partner in the past 12 months	62	15
Had anal intercourse with a casual partner in the past 12 months	15	4
Race/Ethnicity		
Black	334	82
Hispanic	62	15
Other	6	1
Age (Years)		
18 — 24	123	30
25 — 34	118	29
35 — 44	120	29
45 — 50	46	11
Estimated Annual Income (\$)		
0 – 9,999	321	81
10,000 +	75	19
Unemployed	228	57
Highest Level of Education		
Less than high-school degree	136	33
High-school degree	144	35
Greater than high-school degree	127	31
Homeless in the past 12 months	60	15
Arrested and detained in the past 12 months	45	11
Homosexual or bisexual identity	27	7
Any non-injection drug use in the past 12 months	171	42
Binge drinking \geq once a month in past 12 months	155	38
Unprotected vaginal intercourse in the past 12 months	356	87
Concurrency during last sexual relationship	123	31
STI diagnosis in the past 12 months*	62	15
Syphilis	2	<1
Gonorrhea	18	4
Chlamydia	33	8
Herpes	6	1
Human papillomavirus	2	<1
Trichomoniasis	16	4
Pubic Lice	2	<1
Not tested for HIV on a regular basis	218	54
No exposure to or utilization of HIV prevention services	359	88
Age at first vaginal or anal intercourse <15 years	132	32
\geq3 sex partners in the past 12 months	45	11
Any exchange sex in the past 12 months	30	7

Not all categories sum to 407 due to missing data.

* 13 women reported more than 1 type of STI diagnosis in the past 12 months

Table 2. Bivariate Analysis of Demographic, Sexual, and Drug Use Behaviors Among Heterosexual Women at Increased Risk in Chicago by Anal Intercourse in the Past 12 Months

	Anal (n=71) N (%)	No Anal (n=336) N (%)	OR (95% CI)
Age (Years)			
18 — 24	19 (27)	104 (31)	Referent
25 — 34	19 (27)	99 (29)	1.05 (.53-2.10)
35 — 44	24 (34)	96 (29)	1.37 (.71-2.66)
45 — 50	9 (13)	37 (11)	1.33 (.55-3.2)
Race/Ethnicity			
Black	55 (77)	279 (83)	Referent
Hispanic	12 (17)	50 (15)	.84 (.38-1.88)
Other ^a	2 (3)	4 (1)	-
<High-school degree***	35 (49)	101 (30)	2.26 (1.34-3.81)
Estimated annual income <\$10,000	57 (84)	264 (80)	1.26 (.62-2.53)
Homeless in the past 12 months***	20 (28)	40 (12)	2.90 (1.57-5.36)
Unemployed	42 (60)	186 (56)	1.18 (.70-1.99)
Arrested in the past 12 months**	14 (20)	31 (9)	2.42 (1.21-4.83)
Concurrency during last sexual relationship***	34 (50)	89 (27)	2.69 (1.58-4.59)
Unprotected vaginal intercourse in the past 12 months	66 (93)	290 (86)	2.09 (.80-5.47)
Any non-injection drug use***	43 (61)	128 (38)	2.49 (1.48-4.22)
Not tested for HIV on a regular basis	53 (75)	232 (69)	1.29 (.72-2.32)
STI diagnosis in the past 12 months***	21 (30)	41 (12)	3.02 (1.65-5.54)
Any exchange Sex***	12 (17)	18 (5)	3.59 (1.64-7.85)
Homosexual or bisexual identity***	11 (15)	16 (5)	3.67 (1.62-8.29)
Age at first vaginal or anal intercourse <15 years***	35 (49)	97 (29)	2.39 (1.42-4.04)
≥3 sex partners past 12mn***	19 (27)	26 (8)	4.36 (2.25-8.43)
Binge drinking ≥ once a month	32 (45)	123 (37)	1.42 (.85-2.38)
No exposure to or utilization of HIV prevention services	65 (92)	294 (88)	1.56 (.63-3.79)

CI= confidence interval, OR= odds ratio

** $.01 \leq p \leq .05$ *** $p \leq .01$.^aFisher's exact test used where expected cell value was less than 5. Confidence intervals cannot be calculated.

AI was also positively associated with having less than a high school education, sexual identity of homosexual or bisexual, having concurrent partners, and having vaginal or anal intercourse for the first time before the age of 15. AI was not associated with age, race, estimated annual income, unemployment, binge drinking at least once a month, unprotected vaginal intercourse in the past 12 months, not testing for HIV on a regular basis, and not being exposed to or utilizing HIV prevention services in the past 12 months.

The results of multivariable logistic regression are shown in Table 3. The model was adjusted for age and having had unprotected vaginal intercourse in the past 12 months. Three variables were independently correlated with anal intercourse in the past 12 months: having three or more sex partners in the past 12 months (OR 3.27, 95% CI 1.53-6.99), self-reported STI diagnosis in the past 12 months (OR 2.13,

95% CI 1.06-4.26), and having had vaginal or anal intercourse for the first time before the age of 15 (OR 2.23, 95% CI 1.28-3.89). The Hosmer-Lemeshow goodness-of-fit test statistic indicates good model fit ($p=.95$).

DISCUSSION

We found that 17% of women at increased risk in Chicago reported AI in the previous 12 months. The majority (86%) of the women who reported AI in the previous 12 months reported that it was unprotected. Consequently, the exploration of factors associated with anal intercourse aids in the identification and subsequent targeting of heterosexual women who are most susceptible to HIV acquisition.

Women in our study who had AI in the past 12 months were more than three times as likely to report having three or more sexual partners in the past 12 months than women who only had

vaginal intercourse. The relationship between multiple sex partners and AI found in our sample is consistent with previous literature [8, 16, 17].

Table 3. Multivariable Logistic Regression: Factors Associated with Anal Intercourse Among Heterosexual Women at Increased Risk in Chicago

	OR	95% CI	Wald Test P
Age (Years)			
18 — 24	Referent		
25 — 34	1.01	(.49-2.09)	.972
35 — 44	1.20	(.58-2.48)	.615
45 — 50	1.41	(.56-3.55)	.472
Unprotected Vaginal Intercourse in the Past 12 Months			
No	Referent		
Yes	1.77	(.64-4.88)	.272
≥ 3 Sex Partners in the Past 12 Months			
No	Referent		
Yes	3.27	(1.53-6.99)	.002
STI Diagnosis in the Past 12 Months			
No	Referent		
Yes	2.13	(1.06-4.26)	.033
Age at First Vaginal or Anal Intercourse <15 Years			
No	Referent		
Yes	2.23	(1.28-3.89)	.005

CI= confidence interval.
OR= odds ratio.

Having multiple sex partners has been independently linked to HIV transmission [18]; the synthesis of having multiple sex partners and AI may compound this risk. It has been proposed that women who engage in anal intercourse have a tendency to participate in other behaviors that put them at risk for HIV [19, 20]. The combination of risk factors associated with AI in our sample further highlights the importance of targeting this group.

Data on the relationship between STI diagnosis and anal intercourse are inconsistent. A study by Gross *et al.* of women at-risk for HIV infection found that self-reported STI diagnosis was associated with AI [21]. In contrast, three studies measuring the correlation between laboratory confirmed STI diagnosis and anal intercourse did not find such associations [8, 9, 22]. Our findings coincide with those of Gross *et al.* [21].

Several women in our study reported being diagnosed with a STI in the past year. The majority of the STIs reported were non-ulcerative. Non-ulcerative STIs have been noted to increase the risk of HIV transmission, particularly from the insertive to the receptive partner [23]. Women in our sample who reported having AI in the past 12 months had a 2.13 increase in odds of reporting a STI diagnosis in the past 12 months, after controlling for unprotected vaginal intercourse. This association indicates that STI clinic interventions which emphasize

consistent condom use during AI may be more effective than those that address unprotected vaginal intercourse alone.

Our study also found that women who had vaginal or anal intercourse for the first time before the age of 15 were more than twice as likely to report AI in the past 12 months compared to women who initiated intercourse at a later age. Few studies have measured age at sexual initiation as a correlate of AI. Baldwin and Baldwin found that among a random sample of U.S. university students, 33.1% who participated in AI had vaginal intercourse at or before the age 15, whereas only 20.8% of those who did not participate AI had vaginal intercourse at or before the age 15 [19].

The noted association between AI and early sexual initiation in samples with different demographic characteristics suggests a strong relationship between these factors. Informing young sexually active women or women who report sexual activity at a young age about the risks associated with anal intercourse may prove to be beneficial with regard to STI/HIV reduction.

The overall prevalence of sexual initiation before the age of 15 in our sample was high (32%) compared to general estimates of this behavior. Data from the National Survey of Family Growth show that only 13.5% of non-Hispanic Black females and 5.9% of non-Hispanic White females initiate sexual intercourse before the age of 15 [23]. This finding signals a need for interventions that incorporate strategies on building self-confidence and developing relationship negotiation skills for adolescent females living in poverty.

There are limitations to this study. This study was cross-sectional so causality between the HIV risk factors and AI cannot be determined. These data are not generalizable to all urban poverty areas or non-urban poverty areas. All of the data were self-reported so sensitive risk factors, including the outcome variable, may have been underreported. The data used to identify HRAs was limited to AIDS case surveillance data. Chicago HIV case surveillance data as of 2004 was unable to be geocoded due to limitations of code based reporting. Lastly, these data have not been weighted by venue selection probability.

CONCLUSION

The high prevalence of HIV and the low rate of prevention utilization in our sample clearly demonstrate a need for enhanced prevention strategies which target heterosexual women at increased risk. The identification of factors associated with anal intercourse may be an important first step. However, addressing these factors without considering the social context in which they occur would be short-sighted.

The rates of homelessness, unemployment, low educational attainment, and incarceration among study participants were extremely high. A better understanding of how these structural factors affect risk behaviors such as anal intercourse could enhance HIV prevention and health promotion efforts in the future.

Efforts to mitigate structural factors related to HIV and STIs require the coordination and integration of resources from multiple disciplines. Attributes of potential interventions may include economic skill-building, development of sexual negotiation skills in women, expansion of constructive youth social programs, and strategies which reduce social instability and residential isolation.

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CONFLICT OF INTEREST

The authors confirm that this article content has no conflict of interest.

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