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Christopher Salvatore
Montclair State University, salvatorec@montclair.edu

Steven Belenko
Temple University, sbelenko@temple.edu

Richard Dembo
University of South Florida, rdembo@usf.edu

Doris Weiland
Temple University

Matthew Rollie
University of South Florida

See next page for additional authors

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Recently Arrested Adolescents are at High Risk for Sexually Transmitted Diseases

Steven Belenko, PhD[*], **Richard Dembo, PhD**[†], **Doris Weiland, MA**[*], **Matthew Rollie, MPH**[†], **Christopher Salvatore, MA**[*], **Alexandra Hanlon, PhD**[*], and **Kristina Childs, MA**[†]

[*]Departments of Criminal Justice and Public Health, Temple University, Philadelphia, Pennsylvania

[†]Department of Criminology and College of Public Health, University of South Florida, Tampa, Florida

Abstract

Background—Adolescent offenders may be at high risk for sexually transmitted diseases (STDs). With previous research and interventions focused on incarcerated adolescents, data are needed on STD prevalence and risk factors among newly arrested youth released to the community, a far larger subgroup.

Methods—Participants were recruited from all arrested youth processed at the Hillsborough County, Florida Juvenile Assessment Center during the last half of 2006 (506 males, 442 females). Participants voluntarily providing urine samples for drug testing as part of standard protocol were also consented to having their specimens split and tested for chlamydia and gonorrhea, using an FDA-approved nucleic acid amplification test.

Results—STD prevalence was similar to those previously reported among incarcerated adolescents: 11.5% tested positive for chlamydia, 4.2% for gonorrhea, and 13.2% for either or both infections. Prevalence was significantly higher among females: 19.2% of females had either or both infections compared with 10.5% of males. Prevalence was higher for 17 to 18 year olds (15.2% of males, 25.5% of females), blacks, detained youths, drug users, and those engaged in sexual risk behaviors. Previous STD testing experience was limited.

Conclusions—The study indicated that a voluntary STD screening protocol is feasible for arrested youth entering the juvenile justice system, and these offenders are at high risk for STDs. Because most arrested youths are released back to the community, routine testing and treatment of recently arrested youths, and expanded access to risk reduction and prevention programs, can yield substantial public health benefits.

ELEVATED RATES OF *CHLAMYDIA TRACHOMATIS* (chlamydia) and *Neisseria gonorrhoeae* (gonorrhea) are found among adolescents and young adults.[1] In 2006 the highest age-specific chlamydia rates were among 15- to 19-year-old females (2862 cases per 100,000) and 20- to 24-year-old males (857 per 100,000).[1,2] It is estimated that 60% of the annual incident gonorrhea and 54% of incident chlamydia cases are among 15 to 24 year olds.[3] Adolescents involved in the juvenile justice system (JJS) may be at particularly high risk for sexually transmitted diseases (STDs), especially given their high rates of substance abuse and other health problems[4–6] and relatively limited access to preventive health care.[5,7] Data from incarcerated adolescents suggest they are a core group of STD transmitters, with chlamydia

Correspondence: Steven Belenko, PhD, Department of Criminal Justice, Temple University, 5th Floor Gladfelter Hall, 1115 West Berks Street, Philadelphia, PA 19122. E-mail: E-mail: sbelenko@temple.edu.

prevalence rates ranging from 5.9% to 14.4% among males (9.5%–32.5% among females) and gonorrhea prevalence from 0.6% to 6.7% among males (5.1%–18.0% for females).[8–14]

Incarcerated adolescents have relatively high rates of sexual activity, less condom use, earlier initiation of sexual behavior, and more sex with at-risk partners than other adolescents.[6,8,15] Adolescents with a history of adjudication (whether incarcerated) engage in significantly more sexual risk behaviors than those who were never adjudicated, including early initiation, multiple partners, sex with an infected partner, or use of drugs or alcohol during sex.[16] The intersection of high-risk sex and drug use behaviors places adolescent offenders at elevated risk for STDs.[17] An estimated 75% of arrested adolescents have indications of either drug or alcohol involvement.[18] Other studies have found that substance-involved adolescents have higher rates of sexual risk behaviors or STDs than nonusers.[15,19–23] This relationship may reflect the effects of alcohol and illegal drugs on disinhibition, expectancies, libido, social network influences, condom efficacy, or other factors.[19,20,22–24] The use of alcohol and other drugs may also reduce intentions to engage in safer sex and thus undermine the benefits of risk reduction interventions.[25,26]

Previous research has focused on incarcerated adolescents, with scant attention to STD prevalence, risk, and service needs among recently arrested youth as they enter the JJS (i.e., arrested and released back to the community), who represent a far larger sub-population (80%).[27] We are not aware of any STD screening protocols targeting recently arrested adolescents before they are detained or incarcerated. In addition, existing STD screening, even among incarcerated adolescents, tends to be symptom-based,[28,29] suggesting that most STDs among young offenders remain undetected because of the asymptomatic nature of chlamydia and gonorrhea.[14,30] This article presents the first prevalence findings from a recently instituted STD screening protocol for arrested youths in Hillsborough County (Tampa), Florida. In addition to assessing STD prevalence, we were interested in determining whether implementation of such a screening protocol was feasible, given the brief-time period during which arrested youths are processed, and the fact that this processing occurs before formal filing of charges. Given the association between drug use and STD risk noted in previous research, we also compared STD risk for youths testing positive for drugs at arrest and those testing negative.

Materials and Methods

Study Population

Participants were arrested juveniles processed at the Hillsborough County (FL) Juvenile Assessment Center (HJAC) (a centralized intake facility) between June 19 and September 30, 2006 (males, n = 506, weighted n = 962), and between June 19 and December 31, 2006 (females, n = 442). Because females are only about 25% of the overall HJAC population, they were overenrolled to yield sufficient power for gender-specific analyses. Because of eligibility requirements, not all bookings yielded potential enrollees. Youths less than 12 years old were ineligible and those arrested more than once during recruitment were included only on first HJAC admission. The proportion of potential male enrollees per month from June through September 2006 was used to estimate the number of eligible males booked over the entire recruitment period and to calculate a weighting factor of 1.901 for eligible males. In all analyses, the male cohort was weighted to provide estimates for the full population during the recruitment period. The female cohort, based on *all* eligible females, was not weighted.

The HJAC processes all youths arrested in Hillsborough County for delinquent offenses committed before age 18. HJAC staff complete a Detention Risk Assessment Instrument[31] to determine if an arrested youth will be 1) released to the community, 2) placed on nonsecure home detention, or 3) placed in secure detention; about half the youths are released from the

HJAC within 6 hours of booking. Participation in the HJAC assessment process is voluntary. For our protocol, only youths consenting to provide a urine specimen to be tested for illegal drugs were asked to consent to have their specimen split and tested for chlamydia and gonorrhea. Among the eligible 759 males (unweighted) and 634 females who were assessed and asked to participate in the study, 83% of each gender consented to provide the initial urine specimen. Of these, 85.3% of males and 87.5% of females also consented to be tested for STDs (70.5%, 72.7%, and 71.5% of assessed males, females, and youths overall). No significant differences were found in consent rates by gender, race, age, HJAC operational shift (7 AM–3 PM, 3 PM–11 PM, 11 PM–7 AM), or post-HJAC placement.

Consent and Testing Procedures

The collaborative project, involving the HJAC, Florida Department of Health Bureau of Laboratories—Tampa (DOH BOL), Hillsborough County Health Department (HCHD), and Florida Department of Juvenile Justice, was implemented in June 2006 by the senior authors. Under the protocol 1) project-trained HJAC assessors provided brief STD precounseling to arrested juveniles. This new procedure covered the importance of getting tested for chlamydia and gonorrhea, and how these diseases are spread. 2) HJAC assessors asked arrested juveniles to voluntarily provide a urine sample for drug testing (standard protocol), *and* to voluntarily consent to have their urine specimens split and tested for chlamydia and gonorrhea. 3) Coordination was established among HJAC staff, DOH BOL staff, and HCHD Disease Intervention Specialists to provide confidential treatment and posttest counseling to youths testing positive for chlamydia or gonorrhea.

Eligible youths were over age 11 (under Florida law, youths 12 or older are protected from STD test disclosure to parents and do not need parental consent for an STD test). Those consenting to STD testing completed a supplemental risk assessment interview and were informed that, if STD-positive, a HCHD worker would provide free, confidential treatment. To assist contacting STD-positive youths for treatment, HJAC assessors completed a Supplemental Contact Form with sociodemographic and locator information, and post-HJAC placement status (release to community, nonsecure home detention, or secure detention). For STD-positive youths, this Form was sent by DOH BOL staff via secure fax to the HCHD. All recruitment and consent procedures were reviewed and approved by the relevant Institutional Review Boards.

Laboratory Procedures

Urine samples were immediately refrigerated at the HJAC, transported by courier within 24 hours to the DOH BOL, and split for drug and STD testing. Testing for marijuana, cocaine, opiates, and amphetamines employed the enzyme-multiplied immunoassay procedure. Chlamydia and gonorrhea testing used the FDA-approved Gen-Probe APTIMA Combo 2 Assay, a second generation nucleic acid amplification test. Nucleic acid amplification tests are the most sensitive tests currently available for the detection of organisms causing genital *C. trachomatis* infections, and are now widely accepted as noninvasive, urine-based, and more feasible in nonclinical settings.[32] The sensitivity and specificity of the Gen-Probe test are 95.9% and 98.2%, respectively, for chlamydia, and 97.8% and 98.9%, respectively, for gonorrhea.[33]

Statistical Analyses

Point prevalence estimates of chlamydia and gonorrhea infection were calculated, with 95% confidence intervals computed as 1.96 times the standard deviation. Data for the total cohort were weighted to adjust for overrecruitment of females. Bivariate analyses were conducted using SPSS v. 15, with subgroup prevalence and other differences tested using the chi-square statistic or oneway analysis of variance depending on the level of measurement. Statistical

significance was set at $P = 0.05$ (2-sided). For all analyses, the response variable was defined as having tested positive for either chlamydia or gonorrhea, or both.

Multivariate logistic regression models were estimated, using SAS v. 9.1 to determine the independent predictors of any STD. The stepwise method was used, with a 5% significance level of the score chi-square for entering an effect into the model, and of the Wald chi-square for an effect to stay in the model in a backward elimination step. Preliminary models were tested for all participants, with additional models estimated separately for males and females, and for those reporting having been sexually active in the previous 6 months. Variables were selected for inclusion based on significant correlations with STD infection, and for theoretical association with STD risk. Because the significant predictors of STD were very similar for males and females, we present only the full model, including both genders, for youth reporting sexual activity in the previous 6 months.

Results

Characteristics of the Study Cohort

The estimated mean participant age was 15.3. About two-thirds of males and more than half of females were members of minority populations (mainly black). Females were more likely than males to be released from the HJAC to the community (82.1% vs. 73.3%, $P < 0.001$), in part reflecting that they were significantly more likely to be arrested for a misdemeanor rather than a felony offense. These attributes were similar to the profile of all arrestees processed through the HJAC during the study period (Table 1).

As with other juvenile justice populations,[18,34] our cohort had high rates of recent drug use, with an estimated 45.3% of males and 28.6% of females testing positive, mainly for marijuana. Older youths were significantly more likely than younger to test positive for drugs [57.2% of males aged 17 or 18 ($P < 0.001$), 38.7% of females aged 17 or 18 ($P = 0.008$)]. About half the cohort was sexually active and two-thirds reported lifetime sexual intercourse (defined as vaginal or anal sex). However, the cohort included young adolescents who had much lower self-reported rates of sexual activity: among the older participants, an estimated 57.9% of 16 year olds, 75.8% of 17 year olds, and 76.9% of 18 year olds reported having had sex in the past 6 months. Sexual risk behaviors were common; an estimated 45.9% of the cohort reported at least 1 of 4 risk behaviors (multiple partners during the same time period, 3 or more lifetime partners, anal intercourse, seldom/never used condoms), with males more likely to report one or more risk behaviors than females ($P < 0.001$). Youths aged 16 or older were more likely to have engaged in sexual risk behaviors (61.0% of males and 51.7% of females).

Most youth, especially males, had never been tested for STDs. Only 13.5% of youths in the cohort reported ever having been tested for an STD (8.1% of males, 24.9% of females, $P < 0.001$) and only 4.0% reported ever having been told they had an STD (1.5% of males, 9.2% of females). Youths were more likely to have had an HIV test, with higher rates for females ($P < 0.001$).

STD Positivity

The percentage of recently arrested youth testing positive for an STD was within the range previously reported among incarcerated juveniles: an estimated 11.5% of the cohort was positive for chlamydia, 4.2% for gonorrhea, and 13.2% for either or both infections (Table 2). As expected, STD prevalence for both diseases was significantly higher for females: 19.2% of females had either or both infections compared with 10.5% of males.

Prevalence increased with age (Pearson $r = 0.125$ for females, 0.140 for males), with an estimated 15.2% of 17- or 18-year-old males and 25.5% of females aged 17 or 18 testing

positive for an STD. These age effects probably reflect increasing rates of sexual activity for the older youths. Differences by race were also found, with whites having the lowest STD prevalence across both genders (Table 3). Blacks had a significantly higher percentage testing positive for an STD, as did Hispanic females.

Youths who were remanded to secure detention had significantly higher STD prevalence. Among males, an estimated 16.3% of those held in secure detention were positive for STDs, compared with 8.4% of those released to the community either through diversion or nonsecure home detention. For females, 34.2% and 16% were positive, respectively. Youths who tested positive for an illegal drug had significantly higher STD prevalence ($P = 0.004$). Finally, overall STD prevalence was about twice as high among youths with a history of engaging in sexual risk behaviors ($P < 0.001$).

Multivariate Analysis

The results of the final logistic regression model for youths who were sexually active in the past 6 months are shown in Table 4. Overall, this model was significant with $P < 0.0001$ corresponding to a likelihood ratio chi-square statistic of 78.6 and correctly predicted infection status for 71.5% of the cases. Four independent significant factors remained in the model for increased risk of any STD: being female, black, remanded to secure detention or nonsecure home detention, and having 3 or more lifetime sexual partners. Being female increased the adjusted odds of being positive for an STD by 4.67. Being black increased the odds of being infected by 3.62, and being remanded to secure detention or nonsecure home detention after arrest (based on the HJAC public safety risk assessment) increased the odds by 2.32. Only one measure of sex or drug risk behavior remained significant in the model: having 3 or more lifetime sexual partners increased the odds of infection by 2.06.

Discussion

Adolescents are at elevated STD risk, and previous data for incarcerated adolescents have consistently indicated high positivity for chlamydia and gonorrhea. However, there has been almost no STD research among youths at their initial entry into the JJS following arrest. Because most arrested youths spend little time in custody and quickly return to the community,[27] and are not regularly screened for STDs, it is important to estimate STD risk among the broadest possible juvenile justice population. Our pilot, voluntary screening protocol for arrested youths in Hillsborough County demonstrated a high degree of acceptability of STD testing, and found infection prevalence rates that are comparable to incarcerated youths.

An estimated 13.2% of the youths (10.5% of males and 19.2% of females) were infected, with higher rates among older youths, blacks, those remanded to secure detention, and those testing positive for illegal drugs. The higher STD positivity found among youths remanded to detention may reflect that these youths tend to be higher risk in general for delinquency and drug use (based on the HJAC Detention Risk Assessment), and underscores the need for earlier and broader STD screening for youths entering detention. Many detained youths spend a relatively short time in custody, making screening at admission more important. Factors predicting STD infection were similar to those found in studies of incarcerated adolescents,[35] and suggest a need to develop gender-and race-specific risk reduction interventions for delinquent youths. Minority populations are disproportionately represented in the JJS,[36] and also have elevated STD risk in the general population: in 2005, 41.6% of chlamydia cases occurred among blacks and 18.1% among Hispanics; 68% of the total reported gonorrhea cases occurred among blacks.[32]

The high STD risk found among recently arrested youths reflects in part their relatively high rates of drug and sex risk behaviors, compared with nonarrested youths, and previously noted

among incarcerated youths.[6,8,15,16] Most of the older youths in our cohort were sexually active, and an estimated 45.9% had engaged in 1 or more sexual risk behaviors. Rates of sexual activity and risk in our cohort were substantially higher than those observed in general population studies of adolescents.[6,37,38] Although drug use was associated with STD prevalence in bivariate analyses, this relationship was not sustained in multivariate models. Given that only an estimated 13.5% of our cohort had previously been tested for an STD, most adolescent offenders will not be aware of their STD status and thus are putting themselves and their sexual partners at risk. The asymptomatic nature of most bacterial STDs[14,30] increases the urgency to expand routine STD testing, and prevention programs, at *all* stages of the JJS, but especially right after arrest and as youths enter detention.

Several limitations of our study should be noted. Our protocol only included testing for chlamydia and gonorrhea, in part because of the lack of other FDA approved urine-based STD tests. Had we been able to include prevalence data for other STDs, in particular *Trichomonas vaginalis*, overall prevalence would likely have been higher. It is also not known whether the risk factors we identified for chlamydia or gonorrhea are the same for other STDs (although coinfections and substantial overlap in risk factors are likely). In addition, our data from a large southern urban county do not necessarily generalize to adolescent offenders in nonurban settings or other geographic regions. However, existing data from incarcerated youths suggest high STD risk in many different parts of the country. For example, data from CDCs Corrections STD Prevalence Monitoring Project and the Infertility Prevention Project were reported in 2006 from 83 male and 57 female juvenile correctional facilities in more than 20 states.[2] The overall chlamydia positivity was 6.4% for males and 14.3% for females, and gonorrhea positivity was 1.3% for males and 5.2% for females.[39]

A number of risk reduction interventions have been tested with incarcerated high-risk youths[23,26] but access is limited and much more research is needed on effective program models.[40,41] Moreover, given the brief stays in centralized juvenile justice intake centers such as the HJAC, and competing priorities, lengthy interventions may not be feasible at the initial stages of juvenile justice processing and few, if any, centralized intake centers currently have in place procedures to test newly arrested youths for STDs. Brief interventions to increase in interest and motivation for testing, including computerized interventions,[42] may be feasible and should be studied in this setting. Given our findings that a substantial proportion of youths consented to be tested and the high proportion that were positive for chlamydia and gonorrhea, voluntary STD screening for arrested delinquents is feasible, and has the potential to identify many undetected infections and improve health outcomes in this high-risk population, and be part of an overall infertility prevention strategy in this high risk population.[43] Because most arrested youths are released back to the community within a short time, enormous potential public health benefits would result from protocols to routinely test and treat recently arrested youths and to expand access to risk reduction and prevention programs.

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TABLE 1

Cohort Characteristics

	Percent (95% CI)		
	Male (n = 962)*	**Female (n = 442)**	**Total (n = 1404)***
Age†			
12–14	26.1 (23.4–29.0)	32.4 (28.2–36.9)	28.1 (25.8–30.5)
15–16	45.2 (42.1–48.4)	43.7 (39.1–48.3)	44.7 (42.2–47.3)
17–18	28.7 (25.9–31.6)	24.0 (20.2–28.2)	27.2 (25.0–29.6)
Race/ethnicity‡			
White, other (non-Hispanic)	35.0 (32.0–38.0)	43.2 (38.7–47.9)	37.6 (35.1–40.1)
African American	54.0 (50.8–57.1)	49.5 (44.9–54.2)	52.6 (50.0–55.2)
Hispanic	11.1 (9.2–13.2)	7.2 (5.17–10.0)	9.9 (8.4–11.5)
Post-HJAC placement§			
Diversion	55.2 (52.1–58.3)	72.2 (67.8–76.4)	60.6 (58.0–63.1)
Nonsecure home detention	18.0 (15.7–20.6)	10.0 (7.5–13.1)	15.5 (13.7–17.5)
Secure detention	26.8 (24.1–29.7)	17.9 (14.6–21.7)	24.0 (21.8–26.3)
Drug use			
Marijuana§	43.0 (39.9–46.2)	26.5 (22.6–30.8)	37.8 (35.3–40.4)
Opiates	0.6 (0.3–1.4)	0.5 (0.1–1.6)	0.6 (0.3–1.1)
Cocaine	5.9 (4.6–7.6)	4.1 (2.6–6.4)	5.4 (4.3–6.7)
Amphetamines	1.8 (1.1–2.8)	1.8 (0.9–3.5)	1.8 (1.2–2.6)
Any§	45.3 (42.2–48.5)	28.6 (24.6–33.0)	40.0 (37.5–42.6)
Sexual activity			
Ever had sex†	70.6 (67.6–73.5)	63.6 (59.0–68.1)	68.4 (65.8–70.9)
Had sex within past 6 mo	53.2 (49.9–56.4)	48.1 (43.4–52.9)	51.6 (48.9–54.3)
Sexual risk behaviors			
Multiple concurrent partners§	12.6 (10.6–15.0)	5.1 (3.4–7.6)	10.2 (8.7–11.9)
3 or more partners lifetime§	46.8 (43.5–50.1)	31.1 (26.9–35.7)	41.7 (39.1–44.4)
Anal intercourse	3.0 (2.1–4.3)	2.6 (1.5–4.6)	2.9 (2.1–3.9)
Seldom or never used condom‡	13.1 (11.1–15.5)	19.8 (16.3–23.8)	15.3 (13.4–17.3)
One or more risk behaviors§	50.1 (46.9–53.3)	37.3 (32.9–41.9)	46.0 (43.4–48.6)
STD/HIV testing experience			
Ever tested for STD§	8.1 (6.5–10.1)	24.9 (21.0–29.2)	13.5 (11.8–15.5)
Ever tested for HIV§	20.4 (18.0–23.2)	34.6 (30.2–39.3)	24.9 (22.7–27.3)

*Weighted n.

†$P < 0.05$.

‡$P < 0.01$.

§$P < 0.001$.

TABLE 2

Percentage Positive for Chlamydia or Gonorrhea

	Percent (95% CI)		
	Male (n = 961)*	**Female (n = 442)**	**Total (n = 1403)***
Combined test result†			
Chlamydia only	7.5 (6.0–9.3)	12.4 (9.7–15.8)	9.1 (7.7–10.7)
Gonorrhea only	1.4 (0.8–2.3)	2.5 (1.4–4.4)	1.7 (1.2–2.5)
Both	1.6 (1.0–2.6)	4.3 (2.8–6.6)	2.4 (1.7–3.4)
Positive for either or both†	10.5 (8.6–12.5)	19.2 (15.8–23.2)	13.2 (11.5–15.1)

*Weighted n.

†P <0.001.

TABLE 3

STD Prevalence (Percentage Positive) by Cohort Characteristics

	Percent (95% CI)		
	Male (n = 962)*	**Female (n = 442)**	**Total (n = 1404)***
Race/ethnicity			
African American†	15.5 (12.6–18.8)	26.9 (21.5–33.2)	18.9 (16.2–21.9)
Hispanic‡	5.6 (2.6–11.7)	25.0 (13.3–42.1)	10.1 (6.1–16.2)
White/other§	4.5 (2.7–7.3)	9.4 (6.0–14.4)	6.3 (4.5–8.7)
Age			
12–14‡	4.0 (2.2–7.2)	13.3 (8.7–19.8)	7.4 (5.2–10.4)
15–16‡	11.3 (8.6–14.6)	20.2 (15.2–26.4)	14.0 (11.5–16.9)
17–18§	15.2 (11.5–19.9)	25.5 (18.1–34.5)	18.1 (14.5–22.2)
Post-HJAC placement			
Diversion†	7.2 (5.3–9.7)	16.6 (12.6–20.1)	10.7 (8.8–13.0)
Nonsecure home detention	12.1 (8.1–17.9)	11.4 (5.0–24.0)	12.0 (8.3–17.0)
Secure detention‡	16.3 (12.3–21.4)	34.2 (24.7–45.2)	20.5 (16.6–25.2)
Positive for illegal drug			
Yes‡	13.6 (10.7–17.1)	26.2 (19.3–34.5)	16.4 (13.6–19.7)
No†	8.0 (6.0–10.6)	16.2 (12.5–20.7	11.1 (9.1–13.4)
Engaged in sex risk behavior‖			
Yes†	14.4 (11.5–17.9)	29.9 (23.4–37.3)	18.4 (15.6–21.6)
No‡	6.9 (4.9–9.6)	13.0 (9.6–17.5)	9.2 (7.3–11.5)

*Weighted n.

†P <0.001.

‡P <0.01.

§P <0.05.

‖Three or more partners lifetime, multiple concurrent partners, ever had anal intercourse, never or seldom use condoms.

TABLE 4

Significant Predictors of STD Infection: Logistic Regression Results for Youths Who Reported Having Been Sexually Active Within the Past 6 Months (Weighted n = 604.418)*

	Odds Ratio (95% Wald CI)
Risk factor	
Female	4.67 (2.86–7.63)
African American	3.62 (2.25–5.83)
Remanded to secure detention or nonsecure home detention†	2.32 (1.46–3.67)
Having had 3 or more sexual partners lifetime‡	2.06 (1.17–3.62)

* The analysis was run with listwise exclusion of cases with missing data.

† The reference group was youths who received diversion.

‡ The reference group was youths who had 0 to 2 partners lifetime.