Sexually Transmitted Diseases in a Health Maintenance Organization Teen Clinic
Associations of Race, Partner’s Age, and Marijuana Use

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Objective: To determine the role of sociodemographic risk markers and behavioral risk factors associated with sexually transmitted diseases (STDs) in sexually experienced youth seeking care at an urban, general health maintenance organization teen clinic.

Design: Cross-sectional.

Participants: A consecutive, racially and ethnically diverse sample of 285 sexually experienced youth who were preponderantly female (58.6%) and who were aged 16.7 years on average.

Methods: All participants completed a self-report questionnaire and were screened for Chlamydia trachomatis using the ligase chain reaction technique and for Neisseria gonorrhoeae and other STDs using conventional methods.

Results: Many of these youth were at high risk for STDs, having a self-reported history of sex with multiple partners (49.1%), sex with a new partner (42.5%), inconsistent use of condoms (71.9%), and frequent substance use (24.5% used marijuana 1-2 times per week or more). Sexually transmitted disease screening revealed that 11.6% of the participants had 1 or more STDs. A logistic regression analysis to determine the best model for predicting STDs indicated that youth who are African American (odds ratio, 3.34; 95% confidence interval, 1.52-7.35), had sexual partners who were 2 or more years older (odds ratio, 2.63, 95% confidence interval, 1.22-5.67), and used marijuana 1 to 2 times or more per week (odds ratio, 2.27; 95% confidence interval, 1.01-5.13) were more likely to have STDs at screening.

Conclusions: A brief sociodemographic and behavioral risk assessment that includes these factors may be useful for clinicians in deciding when to screen for STDs in sexually active youth seeking care for reasons not related to reproductive health.


Editor’s Note: While the clues for STD screening provided in this study are helpful, I think I’ll still maintain a very low threshold even for those who don’t meet the criteria.

Catherine D. DeAngelis, MD

SEXUALLY transmitted diseases (STDs) are the most pervasive infectious diseases occurring among sexually experienced youth in the United States. Of the estimated 12 million cases reported annually, 25% occur among youth aged 15 to 19 years.1 Chlamydia trachomatis remains the most prevalent reportable STD, with an estimated incidence of 4 million cases occurring each year in the United States.2 In 1997, the rates were highest in sexually experienced adolescent girls and young women aged 15 to 19 years (2044/100 000) compared with adolescent boys and young men aged 15 to 19 years (265/100 000). This disparity can be explained, in part, by increased detection through screening of asymptomatic infection in females, with no comparable screening program for males, and by the empiric treatment of males with symptoms of nongonococcal urethritis without definitive diagnosis or subsequent public health reporting.1 Although the rates of Neisseria gonorrhoeae in youth aged 15 to 19 years declined by 40% between 1994 and 1997, the highest age-specific rates are among same-age females (718/100 000) and the second highest are among same-age males (353/100 000).

Racial and ethnic differences are also apparent in the rates of STDs. In 1997, African Americans accounted for approximately 77% of the total reported cases of gonorrhea. Among youth aged 15 to 19 years, African Americans have the highest reported rates (2828/100 000) compared with the rates of same-age peers,

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PARTICIPANTS AND METHODS

STUDY PARTICIPANTS AND RECRUITMENT

The study participants were a consecutive sample of sexually experienced youth who were seeking health care from a teen clinic based within a large HMO between October 1994 and March 1997. Patients were excluded if they were not sexually experienced, were not between the ages of 13 and 21 years, or had taken a course of antibiotics in the prior 2 weeks. The eligible patients were recruited to participate in a larger study to prospectively assess risk, acquisition, and recurrence of STDs. The present study represents the baseline sociodemographic factors, risk behaviors, and STD screening results from this population. All patients who voluntarily agreed to participate in the study signed a written, informed consent statement and received a copy of the Subjects’ Bill of Rights statement in accordance with the guidelines of our institutional review board.

Patients were approached while waiting to see a physician in the clinic by 1 of 2 research assistants or, in a few instances, after their health care visit if there was no time prior to the clinician visit. Seventy-five percent of all sexually experienced patients recruited to the study agreed to participate. The primary reason for nonparticipation was a lack of time to fill out the baseline questionnaire. Refusal to participate was not associated with sex, race/ethnicity, or reason for the clinic visit. On enrollment in the study, the patients were asked to complete a confidential, self-report questionnaire that took about 20 minutes and to be evaluated for STDs.

MEASURES

Self-Report Questionnaire

The questionnaire included measures of sociodemographic risk markers and risk behaviors related to personal sexual decision making that are associated with the acquisition of STDs. Sociodemographic factors included the study participants’ age, sex, race/ethnicity, and reason for the clinic visit. Other measures included the age and race/ethnicity of the study participants’ sexual partners, and whether the sexual partners had other sexual partners. Risk behaviors included measures of the participants’ number of sexual partners, the number of times sex occurred, the number of new sexual partners, and the frequency of condom use. In addition to these factors, use of alcohol and other drugs were assessed because of their link to sexual risk behaviors. Specifically, study participants were queried about the amount and frequency of alcohol and other drug use. All questions were framed within a 9-month period because previous research indicated that this is a likely period for STDs to recur in young persons. The study participants were also asked about their history of pregnancy or impregnation and their history of STDs.

STD Screening

Chlamydia trachomatis and Neisseria gonorrhoeae. For female participants, urogenital specimens for C. trachomatis were obtained by swab from the endocervix, immediately refrigerated, and transported by courier within 48 hours to our university-based chlamydia laboratory while maintaining a cold chain. Samples were then processed using ligase chain reaction (Abbott Park, Ill) as described previously. An endocervical swab for N. gonorrhoeae screening was also obtained, plated on Thayer-Martin agar, and sent to the central hospital laboratory for routine processing as described previously. Culture was the technique of choice for gonorrheal screening because amplified nucleic acid testing for N. gonorrhoeae was not available to us at the initiation of the study. In males, a first-void urine specimen was used to screen for C. trachomatis using the ligase chain reaction technique. Male participants were instructed to void the first 15 mL of micturition directly into a premarked urine cup, which was transported and processed for ligase chain reaction as described for females. A urethral swab was obtained for N. gonorrhoeae screening and processed as described for females.

Other STDs. Bacterial vaginosis was determined to be present using the Centers for Disease Control and Prevention guidelines. Trichomonas vaginalis was diagnosed if the vaginal pH using nitrazine paper was greater than 5.5 and T. vaginalis were identified as motile flagellated protozoa on a fresh saline wet mount from a vaginal sample using ×40 magnification on microscopy. Syphilis serology (RPR) was performed using standard laboratory protocol in the hospital laboratory. Venereal warts and genital herpes were determined on clinical inspection of the genital skin. Pelvic inflammatory disease was diagnosed using Centers for Disease Control and Prevention criteria. Urethritis was determined by the presence of symptoms (frequency, burning, and dysuria on micturition) and signs (purulent discharge from the urethra in females and males, whether spontaneous or only after urethral stripping).

DATA ANALYSES

Data analyses were conducted using the Statistical Package for the Social Sciences (SPSS, Chicago, Ill). Conventional descriptive statistics were used to assess the characteristics of the study participants and bivariate comparisons by sex and STD diagnosis were conducted using x² tests of differences in proportions and t tests for differences in means. Sociodemographic and behavioral risk factors were dichotomized either on the basis of their mean score or on the basis of extreme scores (low or high risk) to build a logistic regression model. The dichotomized variables that were significantly associated with diagnosis of an STD at the bivariate level were then entered into a stepwise logistic regression equation to determine the best model for predicting an STD diagnosis using a significance level of .10, because significance levels of .05 or lower often fail to identify variables known to be important. Race/ethnicity and sex were entered into the model first, and thus were both control and predictor variables; age was not significantly associated with the outcome measure at the bivariate level and was subsequently excluded from further data analyses. The model’s goodness-of-fit was determined using the Hosmer-Lemeshow statistic. The ability of the logistic regression model to discriminate between the STD-positive participants and the STD-negative participants was measured by calculating the area under the receiving operating characteristics curve. A receiving operating characteristics curve is a graphical representation of the tradeoff between the false-negative and false-positive rates over the range of predicted probabilities generated by the model.
including white (119/100 000), Hispanic (231/100 000), Asian (70/100 000), and American Indian/Alaska Native (355/100 000) youth.1 Although these rates reflect cases reported to the Centers for Disease Control and Prevention primarily by public STD control programs and departments of health, who provide care to patients who are largely of low socioeconomic status, are of minority race/ethnicity, and reside in inner cities. Regardless of the potential bias in reporting, the high rates of both C trachomatis and N gonorrhoeae pose serious health concern for young persons because of their association with adverse reproductive health outcomes in females, including pelvic inflammatory disease, tubal infertility, ectopic pregnancy, and chronic pelvic pain.2 Moreover, genital infections with C trachomatis, N gonorrhoeae, and Trichomonas vaginalis have been shown to increase the risk of human immunodeficiency virus (HIV) transmission.3,4

Sexually transmitted disease–related risk behaviors are prevalent among sexually experienced youth and, therefore, they are at increased risk for acquiring STDs. Many young persons are involved in nonmonogamous sexual relationships and most do not use effective barriers to safeguard against STDs when engaging in sexual intercourse.5,7 A recent national survey of high school students8 shows that almost half (48.4%) of all young persons have engaged in sexual intercourse at some point during their lifetime, and more than one third (34.8%) report current sexual activity (in the 3 months prior to the survey). Racial and ethnic differences are also noted in this sample. African American students were more likely than their white and Hispanic peers to report current sexual activity (53.6%, 32.0%, and 35.4%, respectively) and were more likely to report condom use (64.0%, 55.8%, and 48.3%, respectively). In contrast, use of alcohol or other drugs during their last sexual encounter was higher among white and Hispanic youth compared with their African American peers (26.0%, 25.3%, and 18.1%, respectively). Sex differences were also found among the high school students. For example, compared with females (18.5%), males (30.5%) were more likely to report use of alcohol or other drugs during their last sexual encounter.

Much of what is known about factors associated with STDs in youth is reported from national surveillance data,1,5 STD and family planning clinics,8-14 and youth detention facilities.15,16 However, less is known about the risk and prevalence of STDs in young persons attending general teen clinics.17 Thus, the purpose of this study was to determine the relative significance of sociodemographic risk markers and behavioral risk factors associated with diagnoses of C trachomatis, N gonorrhoeae, and other common STDs in youth attending a general urban health maintenance organization (HMO) teen clinic.

RESULTS

CHARACTERISTICS OF THE STUDY POPULATION

Three hundred three sexually experienced youth were recruited to participate in the study. Of these, 18 (5.9%) reported not being sexually active in the 9 months prior to enrollment in the study. Because this variable and all other risk variables were reported in a 9-month time frame, they were excluded from further statistical analyses. The remaining 285 study participants (94.1%) were on average 16.7 years of age (range, 13-21 years) and preponderantly female (58.6%). They were racially and ethnically diverse (African American, 43.0%; white, 15.1%; Hispanic, 14.0%; Asian, 13.1%; mixed race/ethnicity, 12.3%; and other race/ethnicity, 3.0%) (Table 1). The primary reason for their visit to the clinic at the time of enrollment in the study was for reproductive health care (61.3%), including an annual pelvic examination, a pregnancy examination, contraceptive care, or an STD check. Other reasons not related to reproductive health (38.7%) included a well-care visit, care for an acute illness, or a nonreproductive health–related follow-up visit. Most study participants (76.1%) were identified as asymptomatic by routine clinician-obtained history at the time of enrollment in the study.

STD-RELATED RISK FACTORS

Overall, the study participants were at high risk for acquiring STDs. Specifically, 23.2% reported a history of pregnancy or impregnation (4.3% of the adolescent girls and young women were identified as pregnant at screening), and 28.8% reported a history of STDs. Within the 9 months prior to the study, 49.1% had sex with 2 or more sexual partners; 52.0% had sex on 10 or more occasions; 42.5% had sex with a new partner; 71.9% inconsistently used condoms when engaging in sexual intercourse (28.1% used them with each sexual encounter); and 64.7% thought their sexual partner had had sex with someone other than themselves. In addition to these factors, 44.1% of the participants had sexual partners of African American descent, and 55.9% had partners of other than African American racial/ethnic background; 40.0% of the sexual partners were 2 or more years older than the study participants (mean age, 18.6 years; mean age difference, 1.55 years; 26.8% had sexual partners that were 3-12 years older than themselves). Alcohol and marijuana use was prevalent in this population; 20.2% reported alcohol use 1 to 2 times per week or more (2.9% reported daily use), and 24.5% reported use of marijuana 1 to 2 times per week or more (10.8% reported daily use; see Table 1).

SEX DIFFERENCES IN STD-RELATED RISK

A comparison of study participants by sex reveals significant differences in risk. Specifically, adolescent boys and young men were more likely than their female counterparts to be older, have multiple sexual partners, use condoms more consistently, and have sexual partners of another race/ethnicity, including Asians and those of mixed race/ethnicity. In contrast, adolescent girls and young women, when compared with their male peers, were more likely to report more frequent sex, older sexual partners, and partners who were African American (Table 1).
Results of the STD screening indicate that 33 (females, 8.4%; males, 3.2%) study participants were diagnosed with 1 or more STDs; 8.8% (females, 6.7%; males, 2.1%) had C. trachomatis, 2.5% (females, 1.4%; males, 1.1%) had N. gonorrhoeae, and 0.7% had T. vaginalis (all female). No other STDs were identified. Of these subjects, 8.7% (females, 5.6%; males, 3.2%) had 1 STD and 2.9% (all female) had more than 1 STD. Among the youth diagnosed with STDs, 78.1% were seeking care for reproductive health concerns while 21.9% were seeking care unrelated to reproductive health. In addition, 57.6% of those with STDs were asymptomatic at the time of screening and 42.4% had 1 or more STD-related symptoms (33.3% of the females and 9.0% of the males with STDs had symptoms).

### BIVARIATE CORRELATES OF STDs

A comparison of the dichotomized sociodemographic and behavioral risk factors by STD diagnosis reveal that sex ($\chi^2 = 3.07$, $P < .10$), the participant's race/ethnicity (African American vs all other racial/ethnic groups; $\chi^2 = 8.95$, $P < .01$), the sexual partner's age (<19 years vs ≥19 years; $\chi^2 = 5.56$, $P < .05$), the race/ethnicity of the study partici-
marijuana use (a disease 70% of the time. Known to have a disease and a patient not known to have the range of predicted probabilities generated by the model. The best model for predicting STDs.

LOGISTIC REGRESSION MODEL PREDICTING STDs

While controlling for the effects of sex and race/ethnicity, the results of the logistic regression model indicate that STDs were significantly related to African American race, an older age of the study participants' sexual partners, and use of marijuana once per week or more. Relative to the other variables in the equation, sex and race of the study participants' sexual partners were not significantly associated with an STD diagnosis (Table 2). Overall, the model's estimates for numbers of expected positive and negative STD outcomes (goodness-of-fit) were consistent with the observed outcomes (χ² = 1.37, P = .97). In addition, the model shows a good level of discrimination between positive and STD-negative participants (the area under the receiving operating characteristics curve = .70; Figure). That is, over the range of predicted probabilities generated by the model, we can correctly discriminate between a patient known to have a disease and a patient not known to have a disease 70% of the time.

Table 2. Logistic Regression Model Predicting Sexually Transmitted Diseases

<table>
<thead>
<tr>
<th>Variable</th>
<th>Odds Ratio (95% Confidence Interval)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>African American race</td>
<td>3.34† (1.52-7.36)</td>
</tr>
<tr>
<td>Older sexual partner</td>
<td>2.63† (1.22-5.67)</td>
</tr>
<tr>
<td>Marijuana use &gt;1-2 times per week</td>
<td>2.27† (1.01-5.12)</td>
</tr>
</tbody>
</table>

*Model χ² = 19.71; P < .001.
†P < .05
‡P < .01.

The excessive use of marijuana in this population was a surprising finding. Although alcohol use is more prevalent overall, marijuana is more frequently used by the young persons; 3% of the participants use alcohol daily and 11% use marijuana daily (21% of those diagnosed with an STD used marijuana daily). We found pregnant (72%) did not use condoms during any sexual encounter within the previous 9 months. Overall, the findings on high-risk behaviors among young persons are consistent with national surveillance data on STD risk in youth and with other clinic-based studies of those seeking care at STD and family planning clinics. By their nature, these clinics provide care primarily to young persons seeking health care for reproductive reasons. Our data include young persons seeking care in a general, HMO teen clinic for reasons unrelated to reproductive health. Of those diagnosed with an STD, 21.9% were seeking care for reasons unrelated to reproductive health and 57.6% were asymptomatic at the time of screening. These findings are similar to a large community-based study that identified Chlamydia by urine ligase chain reaction in 6.9% of a group of young persons who were largely asymptomatic (73.4%). It is the undetected asymptotically infected persons who themselves remain at risk to develop sequelae of STDs such as pelvic inflammatory disease, ectopic pregnancy, and infertility and who continue to unknowingly transmit infections to their sexual partners.

A unique finding of this study was the participants' belief that their sexual partner(s) had had sexual intercourse with someone else. Although one third of them thought it was a possibility that this was the case, almost one third (32%) knew for certain. In light of their inconsistent use of condoms to safeguard against STDs, it is apparent that many of these youth are knowingly placing themselves at risk for acquisition of STDs, and possibly HIV. Although most California youth attending school have learned about risk factors associated with HIV transmission, it is possible that, despite this knowledge, many of them do not perceive themselves or their sexual partners to be at risk for STDs, including HIV. Our data suggest a need to assist young persons in appropriately aligning their actual level of risk with their perception of their personal risk.

The excessive use of marijuana in this population was a surprising finding. Although alcohol use is more prevalent overall, marijuana is more frequently used by the young persons; 3% of the participants use alcohol daily and 11% use marijuana daily (21% of those diagnosed with an STD used marijuana daily). We found

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that the prevalence of marijuana use seems to be higher than that reported by other studies, even though we did not measure frequency of use in the same manner. For example, the national school survey indicated that 26% of the students reported marijuana use in the 30 days prior to the survey; overall, 44% of our study participants reported use once a month or more. This frequency was much higher among those diagnosed with an STD (55%). These findings strongly suggest that the use of illicit substances, especially marijuana, plays a role in risk and acquisition of STDs for young persons. It is possible that addressing substance use behavior in young persons may influence their decision-making processes and ultimately the behaviors that place them at risk for STDs. More detailed research that assesses the social and cultural context of marijuana use in urban minority youth, especially as related to sexual activity, is clearly warranted.

THE ROLE OF SOCIODEMOGRAPHIC FACTORS

Several sex differences were identified among the sociodemographic and behavioral factors. However, once STDs were considered, the sex and race/ethnicity of the study participants and the age and race/ethnicity of their sexual partners were the only significant sociodemographic factors associated with an STD diagnosis. Specifically, our results show that, compared with their counterparts, female youth and African American youth were more likely to be diagnosed with an STD. These findings are consistent with current national surveillance data on STDs and with recent STD clinic-based studies of young persons. Other recent research on the role of race in STDs among youth indicates that, compared with their peers, the risk behaviors of African American youth do not account for their higher rates of STDs in this population but may be explained, in part, by their selection of sexual partners. The authors speculate that African American youth’s increased risk of STDs may, in part, be related to a higher prevalence of STDs among their sexual partners who are older men and women who trade sex for drugs and who may be members of geographic “core groups” within which there is a high prevalence of STDs. This contention is partially supported by our study, which indicates that youth diagnosed with STDs had partners who were 2 or more years older than themselves and who were African American. Other research may also help to explain these findings that indicate that African American youth are more likely than their Hispanic peers to choose sexual partners who are of the same race/ethnicity. Moreover, this study found that adolescent girls and young women had older sexual partners than the adolescent boys and young men, but these factors were not related to STD risk.

PREDICTORS OF STDs

A goal of our study was to determine the best model for predicting STDs in this population. We found the most salient predictors of STDs to be the race of the study participant, the age of their sexual partners, and the frequent use of marijuana. Specifically, our data indicate that, compared with their peers, African American youth and young persons (especially females) whose partners are 2 or more years older than themselves are 3 times as likely to acquire an STD. The risk is more than doubled for young persons who use marijuana more than once a week. Clinicians who provide health care to youth in general teen clinics have unique opportunities to screen large numbers of youth and to counsel them about the risk and prevention of STDs. Owing to the lack of time and appropriate skills in knowing who to screen, when to screen, and what behaviors are most salient for disease acquisition, many clinicians may miss important opportunities to screen their patients who are seeking care for nonproductive reasons. The Guidelines for Adolescent Preventive Services recommend that young persons should be screened annually for STDs and for risk behaviors, including the use of alcohol and other “abusable” substances, condom use, number of sexual partners, sex in exchange for money, and history of pregnancy and STDs. Our data suggest that these recommendations should be extended to include the age of the sexual partner and more specific detail on the frequency and amount of illicit substances used, such as marijuana. Moreover, our data suggest that in this era of managed care with its emphasis on cost containment, as is the case for HMO clinics, it may prove to be efficacious for clinicians to target screening of youth for STDs on the basis of a brief sociodemographic and behavioral risk assessment that includes information on race, age of sexual partners, and use of illicit substances such as marijuana. Clearly, additional studies are needed to determine if these results are generalizable to other clinic settings and to other urban populations.

STUDY LIMITATIONS

Several limitations to this study should be noted. Because the study design was cross-sectional, causal associations between the predictors and outcomes should not be inferred. Also, because the questionnaire was self-reported, the veracity of the study participants’ responses may be questioned, especially because it involved sensitive sexual, alcohol, and other drug use behaviors. However, precautionary steps were taken to increase the participants’ willingness to answer each question as honestly as possible, including hiring research assistants who were not a part of the permanent clinic staff and ensuring the participants that their data would be held in the strictest of confidence and would not be shared with the clinic staff. However, despite these limitations, our findings are consistent with national data as well as other clinic-based studies of STD risk in young persons. To our knowledge, our study is unique in that it focuses on young persons seeking care in a general HMO teen clinic.

Overall, this study contributes to the growing body of literature describing factors associated with acquisition of STDs in young persons. It supports the need to extend STD screening beyond those who seek care for re-
productive health reasons and beyond traditional health care settings. With the development of sociodemographic and behavioral assessments, like those evaluated in this study, and with recent advances using non-invasive, urine-based screening for common STDs, it may be now possible to apply STD screening more broadly. For example, STD screening may now be available to the sexually experienced adolescent boy or young man whose only contact with the health care system is for an ankle sprain treated in an urgent care setting, the adolescent girl or young woman who is treated for acne in a dermatology clinic, or the youth who receives free cholesterol screening or immunizations at a local girls’ or boys’ club. Adolescent health care providers are now challenged to further research the best strategies for screening for STDs among sexually experienced youth that may include evaluation of sociodemographic risk markers, behavioral risk factors, and urine testing to eliminate undetected STDs among young persons.

Accepted for publication December 16, 1998.

This work was supported by grant 131-1854 from the Kaiser Foundation Research Institute, Oakland, Calif (Drs Boyer, Shafer, and Wibbelsman) and grant MCI00978 from the Maternal and Child Health Bureau, Washington, DC (Drs Boyer and Shafer).

Presented in part at the Western Regional Meeting of the American Federation for Medical Research, Western Society for Pediatric Research, Carmel, Calif, February 6, 1998.

We thank Nydia Lovell, BSW, for her hard work and diligence in working on this project.

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REFERENCES


Correction

Error in References. References 12 through 31 were numbered incorrectly in the text and reference 11 was omitted in the list of references in the article entitled “Sexually Transmitted Diseases in a Health Maintenance Organization Teen Clinic: Associations of Race, Partner’s Age, and Marijuana Use” published in the August issue of the ARCHIVES (1999;153:838-844). Subsequent references should have been numbered 11 through 30, not 12 through 31, in the text and in the list of references.