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# Prevalence of Sexually Transmitted Infections in At-Risk Adolescent Females at a Comprehensive, Stand-Alone Adolescent Health Center in New York City

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## Abstract

**Background—**Sexually transmitted infections (STIs) are common among adolescents, and multiple STIs over one's lifetime can increase health risks. Few studies have assessed lifetime STI prevalence. This study evaluates minority, underserved adolescents' self-reported lifetime STI history and objective STI rates.

**Methods—**Lifetime STI rates of female patients at an urban adolescent health center were obtained from self-administered questionnaires. Additionally, STI test results were retrieved from electronic medical records.

**Results—**Patients reported a high lifetime prevalence of STIs. By comparing self-report and objective data, underreporting was identified for chlamydia, gonorrhea, and herpes.

**Conclusions—**STI rates in at-risk adolescent females are higher than in the general population and remain elevated over time. Lifetime STI reports could expand our understanding of sexual health and should be further studied. Underreporting, which may increase health risks and hinder health care delivery, requires further investigation. Improvements in STI screening and prevention targeting at-risk populations are warranted.

### Keywords

sexual health; self-report; underreporting; electronic medical records; EMR; HPV vaccine

## Introduction

Sexually transmitted infections (STIs) are a significant source of morbidity among at-risk adolescent females.[1,2] The negative health outcomes related to STIs range from acute to



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long-term, including the acquisition of other STIs, pelvic inflammatory disease (PID), chronic pelvic pain, infertility, malignancy, and systemic infection.[2] STIs have also been shown to lead to negative psychosocial effects, including depressive symptoms, self-blame, and behavioral disengagement.[3,4] Adolescents are particularly vulnerable to STIs due to their immature reproductive and immune systems,[2] in addition to their increased propensity toward risk-taking behavior.[2,5–8] Risk-taking behavior among adolescents extends across many domains, including tobacco, alcohol, and drug use, behaviors that contribute to unintentional injury and violence, and sexual behaviors that lead to unintended pregnancy and STI and HIV acquisition.[8] The Youth Risk Behavior Surveillance System identifies specific behaviors among American high school students that contribute to reproductive and sexual health morbidity.[8] Among the 33.7% of currently sexually active high school students across the United States, only 60.2% reported that either they or their partner had used a condom during their last sexual intercourse, and 22.1% had participated in mind-altering substance use, including alcohol and drugs, prior to their last sexual intercourse.[8] Furthermore, nationwide, 15.3% of students had had sexual intercourse with a large number of partners (4 or more) during their lifetime,[8] increasing their likelihood of STI transmission. [2,9] Unfortunately, initiatives to increase STI screening, prevention, and treatment across the United States have been largely ineffective in reducing adolescent STI rates.[1] In the United States, adolescents and young adults between the ages of 15 and 24 account for almost half of all new cases of STIs,[1,10] and those between the ages of 13 and 24 account for over a quarter of all new cases of HIV.[11] In the United States, the highest STI rates are found in low socioeconomic status and minority adolescents,[1] prompting increased attention on these groups for prevention and screening efforts.

The increased STI rates among adolescents as compared to adults may be due to the fact that adolescents face more significant barriers to STI treatment and prevention services, including inability to afford medical care and health insurance, lack of transportation to health care facilities, concerns about their reproductive health confidentiality, and discomfort attending adult health care centers.[1,2] Many studies have assessed adolescent STI prevalence in patients attending pediatric outpatient offices, family planning centers, and adult obstetric-gynecologic or genito-urinary clinics.[12–14] These locations, by nature of their nonadolescent focused structure, are the very settings in which adolescents face barriers to care. This study was conducted in a stand-alone, comprehensive primary care center solely for adolescents, which provides medical services free of cost. Therefore, the health care facility from which our data was derived reduces many of the barriers to accessing health care for its adolescent patients, and is thus an ideal facility for STI research, screening, and management.

The majority of extant literature of STI rates among urban adolescent females is cross-sectional in nature. These studies have reported rates of human papillomavirus (HPV) between 15% and 82% and *Chlamydia trachomatis* between 11% and 22% when assessed at a single point in time.[9,13–17] *Neisseria gonorrhoeae* carries lower, but still significant, cross-sectional rates of 2% to 9%.[9,13–17] However, cross-sectional data do not provide a picture of lifetime prevalence, which may carry greater clinical utility for determining future prevention efforts. Patients with a history of multiple STIs over their lifetime are at

increased risk for the negative health outcomes associated with STIs, such as PID, infertility, and depression.[2–4,11] Lifetime STI prevalence is thus a crucial aspect of a patient's medical history, and studies that identify populations with high lifetime prevalence rates may provide important information for future STI screening and management. STI prevalence rates may be determined by data derived from self-report or from objective test results. Electronic medical records (EMR) provide a means of documenting and tracking patients' test results objectively over time. Both self-reported lifetime and objective EMR data provide important information and may be complimentary components of a complete picture of adolescent STI rates.

The goal of this study was to determine both self-reported lifetime STI rates as well as STI prevalence rates derived from patient EMR among high-risk, minority adolescent female patients at a comprehensive, stand-alone, free adolescent health center in New York City. EMR data for each participant was compared with self-reported lifetime data for potential incongruence (e.g., negative self-reported lifetime history but positive EMR record).

## Methods

### Participants

Data were derived from female adolescent patients taking part in an ongoing study of the effectiveness of the HPV vaccine recruited from a large, inner-city adolescent health center in New York City. Patients were eligible to participate if they (*a*) were between 12 and 19 years of age at time of consent, (*b*) had ever engaged in vaginal or anal intercourse, and (*c*) intended to get or had already received the FDA-approved HPV vaccine (GARDASIL™®). Patients who were pregnant at time of recruitment or who had terminated a pregnancy within the last 4 weeks were excluded. Data from the first 861 adolescent females enrolled in the parent study were retrieved from EMR and self-report questionnaires. The mean age of participants for whom data were retrieved was 17.7 ± 1.36 years at time of enrollment into the parent study. Fifty-eight percent of participants for whom data are reported in this study were Hispanic, 48% were African American, and 6% were Caucasian (participants could choose more than one category). See Table 1. All participants reported being sexually active. Written informed consent was collected from all participants prior to enrollment. This study was approved by the Institutional Review Board at Mount Sinai School of Medicine and the Committee for Clinical Investigations at Albert Einstein College of Medicine.

### Electronic Medical Records

We retrieved laboratory test results from our adolescent health center's EMR system from all tests for chlamydia, gonorrhea, HIV, syphilis, and genital herpes from February 2009 (date of EMR launch) to the date of the patient's enrollment into the parent study.

### Self-Report Questionnaire

A self-administered questionnaire was completed by all participants at the time of enrollment in the parent study. The questionnaire assessed self-reported history of STIs, including chlamydia, gonorrhea, HPV, human immunodeficiency virus (HIV), syphilis,

trichomoniasis, genital or oral herpes simplex virus (HSV), and pubic lice. Questions were asked on the questionnaire in the form, “Have you EVER been told by a doctor or other healthcare professional that you have any of the following [STIs]?”

## Results

### Self-Reported Lifetime Data

Of the 861 participants, 31.8% reported ever having chlamydia, 6% reported ever having HPV, 5.8% reported ever having trichomoniasis, 4.7% reported ever having gonorrhea, 3.4% reported ever having genital warts, 2.3% reported ever having genital herpes, 1.6% reported ever having syphilis, 1.5% reported ever having oral herpes, 1.1% reported ever having perineal warts, 1.1% reported ever having HIV, 1% reported ever having pubic lice, and 0.4% reported ever having perineal herpes. See Table 2. Incidentally, 25 of the 861 participants reported non-STI diagnoses including yeast or urinary tract infection as a subjective written response to the question, “Have you ever had any other STI?”

### Electronic Medical Record Data

Of patients tested for the following prior to enrollment in the parent study, 15.4% tested positive for chlamydia, 12.5% tested positive for genital herpes, 5.6% tested positive for gonorrhea, and none tested positive for syphilis or HIV. See Table 3.

### Check of Congruence Between Self-Report and EMR Data

Seven of 259 participants (2.7%) tested for chlamydia reported a negative lifetime history of chlamydia but had a positive chlamydia test result in the EMR. Similarly, 8 of 283 participants (2.8%) tested for gonorrhea and 1 of 16 participants (6.3%) tested for genital herpes reported a negative lifetime history despite a positive test result in the EMR. For both HIV and syphilis, of all participants tested, there were no cases of patients reporting a negative history despite positive test results in the EMR. See Table 4.

## Discussion

Sexually transmitted infections are common among adolescents and can lead to a number of negative physical and mental health outcomes,[1–4,11] and a history of multiple STIs over a patient’s lifetime leads to increased health risks.[2,5,6] Our study sought to expand on the existing literature, which has largely studied cross-sectional STI rates and subsequent health outcomes,[9,13–17] by evaluating adolescent patients’ self-reported lifetime STI history and objectively documented EMR STI history.

The CDC’s most recent national data of cross-sectional chlamydia rates reported 3.4% for females ages 15 to 19 and 3.7% for females ages 20 to 24.[1] From family planning clinics, the national chlamydia rate was reported to be 6.9% for females ages 15 to 24.[1] Nationally, minority patients demonstrated higher chlamydia rates than their nonminority counterparts.[1] Specifically, minority youth have higher rates of chlamydia, gonorrhea, syphilis, HSV, and HIV than the general adolescent population.[2] Data from our adolescent patient population, consisting of greater than 90% minority patients and greater than 60% low socioeconomic

status (SES), demonstrated relatively high EMR STI rates over the course of several years. These data, while not directly comparable to cross-sectional data, could add to our understanding of existing reports. Prior studies have demonstrated that the associations between race, socioeconomic status, and STIs stem from the complex interplay between behavior, access to health care, and sexual networks.[1,2,8,18] Thus, there is a clear need for improved sexual health screening and management efforts for lower SES and minority adolescent girls.

Patients with a negative self-report history and a positive objective EMR result, which occurred for chlamydia, gonorrhea, and herpes, either failed to recall their diagnosis or misreported their STI history on the self-report questionnaire. Evaluating the relationship between self-reported STI history and objective STI history could have implications for adolescent health and well-being. Patients who reported a negative STI history despite objectively positive STI test results could pose a health risk to themselves and to their sexual partners.[18] Patients who were aware of their true medical history but chose not to disclose it on the self-report were likely subject to social desirability bias, influenced by perceived social norms for sexual behaviors.[18,19] Failure to disclose STI history to medical providers can lead to suboptimal medical care, as well as lack of opportunity to receive crucial medical counseling and anticipatory guidance regarding reproductive health care.[18] Furthermore, failure to accurately report STI history to one's clinician might hinder disease control measures by interfering with partner notification and referral services.[18] Along this vein, lack of STI disclosure to one's partner is of further concern, as partner notification of one's STI history is a crucial aspect of disease screening and prevention.[20] The discordance between objective STI data and recalled history is an important relationship requiring further study to elucidate its root causes.

Evaluating STI rates over time has many potential implications for adolescent health care. A history of multiple STIs over a lifetime places a patient at higher risk for negative health outcomes, such as PID, chronic pelvic pain, infertility, and malignancy.[2,5,6] For example, concurrent infections with *C. trachomatis* and persistent HPV have been shown to be associated with cervical cancer.[21] Furthermore, high lifetime prevalence of STIs correlates with increased risk-taking behavior in other arenas,[4] which would predispose these adolescents to further adverse psychosocial and medical outcomes.[8] Specifically, high STI rates correlate with school failure, substance use, and poor mental health.[3,4] The relationship between positive lifetime STI history and negative psychosocial and medical outcomes suggest that it may be prudent to target patient populations with high STI rates for comprehensive risk reduction efforts to decrease the frequent comorbid conditions.[7,17,21,22] Studies examining STI rates over time may be useful for understanding individual patients' future health risks, predicting patient population infection rates in years forward, and helping target high-risk populations in STI screening and management efforts.

This study has several limitations. Self-report data may be subject to social desirability bias.[19,23] However, the fact that our self-reported lifetime prevalence rates were higher than the lifetime STI rates typically seen in the literature suggests that either underreporting was not highly prevalent in this sample or that lifetime prevalence rates are even higher in this population than our study found. Our study population consisted of adolescent females

previously recruited to participate in a large-scale study to assess HPV rates in adolescent females who had intended to get or had already received the FDA-approved HPV vaccine (GARDASIL™®). The study does not include all patients attending the health center or a random sample of the female adolescents in the surrounding geographical area, thus limiting our study to a specific cohort of patients and making our results less representative of the general female adolescent population.

In summary, this study is an analysis of data derived from participants in a larger study on HPV in adolescent females attending a free-standing, no cost, primary care adolescent health center in an urban location with adequate public transportation. Our data show a high prevalence of STIs from both a self-reported perspective and objective EMR in our primarily low-SES, minority sample. A check of congruence between self-reported lifetime prevalence and EMR data identified underreporting for particular STIs. Such underreporting may place adolescents at risk and hinder the delivery of health care services and should be further investigated in future research. These data may be particularly useful when considered in conjunction with prior cross-sectional studies to create a comprehensive picture of STI prevalence in underserved, minority adolescent females. Taken together with prior literature, findings in this study suggest that STI rates in at-risk adolescent females are higher than in the general population and persist at an elevated level throughout adolescence, thus improvements in STI prevention and management efforts targeting high-risk populations are required.

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**Table 1**

Sample Demographics.

| | Number | Percentage |
|---|---|---|
| Ethnicity (may be more than one) | | |
| Hispanic | 503 | 58.4 |
| Black | 417 | 48.4 |
| White | 50 | 5.8 |
| American Indian | 35 | 4.1 |
| Asian | 17 | 2.0 |
| Place of birth | | |
| United States of America | 761 | 88.3 |
| Puerto Rico or Caribbean country | 58 | 6.7 |
| Mexico, Central America, or South America | 12 | 1.4 |
| Africa, Asia, or Europe | 11 | 1.3 |
| Other | 11 | 1.3 |
| Currently in school or college | | |
| Yes | 729 | 84.7 |
| No | 129 | 15.0 |

**Table 2**

Self-Reported Lifetime History of STI.

| | Positive/ Tested[a] | S-R Lifetime Prevalence |
|---|---|---|
| Chlamydia | 267/839 | 31.8% |
| HPV | 50/828 | 6.0% |
| Trichomoniasis | 48/828 | 5.8% |
| Gonorrhea | 39/825 | 4.7% |
| Genital warts | 28/824 | 3.4% |
| Genital herpes | 19/825 | 2.3% |
| Syphilis | 13/823 | 1.6% |
| Oral herpes | 12/824 | 1.5% |
| Perineal warts | 9/825 | 1.1% |
| HIV | 9/823 | 1.1% |
| Pubic lice | 8/823 | 1.0% |
| Perineal herpes | 3/820 | 0.4% |

Abbreviations: STI, sexually transmitted infection; HPV, human papillomavirus.

[a]Number of participants who reported ever having the above STI/number of participants who provided data.

## Table 3

Electronic Medical Record Data.

| | Positive/ Tested[a] | % Positive |
|---|---|---|
| Chlamydia | 40/259 | 15.4% |
| Genital herpes | 2/16 | 12.5% |
| Gonorrhea | 16/285 | 5.6% |
| Syphilis | 0/411 | 0% |
| HIV | 0/453 | 0% |

Abbreviation: STI, sexually transmitted infection.

[a]Number of participants with a positive STI test result/number of participants tested for that STI.

**Table 4**

Evaluation of Congruence Between Self-Report and EMR data.

| | No. Tested[a] | Yes/ Yes[b] | No/ No[c] | % Agreement[d] | Pos Epic/ Neg S-R[e] | Neg Epic/ Pos S-R[f] | S-R Don't Know[g] |
|---|---|---|---|---|---|---|---|
| HIV | 442 | 0 | 434 | 98 | 0 | 4 | 4 |
| Gonorrhea | 283 | 7 | 254 | 92 | 8 | 12 | 2 |
| Syphilis | 405 | 0 | 396 | 90 | 0 | 6 | 3 |
| Genital herpes | 16 | 1 | 11 | 75 | 1 | 2 | 1 |
| Chlamydia | 259 | 33 | 159 | 74 | 7 | 60 | 0 |

Abbreviations: STI, sexually transmitted infection; EMR, electronic medical record.

[a] The number of participants tested for the above STIs for whom both EMR and self-report data are documented.

[b] The number of participants who self-reported having the respective STI and had a corresponding positive test result for that STI documented in the EMR (agreement).

[c] The number of participants who self-reported never having the respective STIs and had a corresponding negative test result for that STI documented in the EMR (agreement).

[d] Of all participants tested for the respective STI, the % total agreement between self-report and EMR records ((yes/yes + no/no)/N tested).

[e] The number of participants who self-reported a negative history of the respective STI yet had a contradictory positive test result for that STI documented in the EMR.

[f] The number of participants who self-reported a positive history of the respective STI at some point in their lifetime despite only negative test results for that STI documented in the EMR.

[g] The number of participants who responded that they did not know whether they ever had the respective STI in their lifetime.