Chlamydia Screening Among Young Women: Individual- and Provider-Level Differences in Testing

WHAT'S KNOWN ON THIS SUBJECT: Chlamydia testing among adolescents and young women without symptoms is recommended by the US Preventive Services Task Force, but only approximately one-half of eligible young women presenting for health care are screened appropriately.

WHAT THIS STUDY ADDS: Our work indicates that providers screen young women for chlamydia differentially according to patient age, race/ethnicity, insurance status, and sexual health history. Biases in chlamydia screening may contribute to higher reported rates of chlamydia among minority and poor young women.

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KEY WORDS

adolescent, *Chlamydia trachomatis*, pregnancy, prevention, control, sexually transmitted diseases, young adult

ABBREVIATIONS

STI—sexually transmitted infection
RMRS—Regenstrief Medical Record System
ICD-9—International Classification of Diseases, Ninth Revision
HEDIS—Healthcare Effectiveness Data and Information Set

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abstract

OBJECTIVE: We assessed differences in chlamydia screening rates according to race/ethnicity, insurance status, age, and previous sexually transmitted infection (STI) or pregnancy.

METHODS: A retrospective cohort study was performed using electronic medical record and billing data for women 14 to 25 years of age in 2002–2007, assessing differences in the odds of a chlamydia test being performed at that visit.

RESULTS: Adjusted odds of a chlamydia test being performed were lower among women 14 to 15 years of age (odds ratio: 0.83 [95% confidence interval: 0.70–1.00]) and 20 to 25 years of age (20–21 years, odds ratio: 0.78 [95% confidence interval: 0.70–0.89]; 22–23 years, odds ratio: 0.76 [95% confidence interval: 0.67–0.87]; 24–25 years, odds ratio: 0.64 [95% confidence interval: 0.57–0.73]), compared with women 18 to 19 years of age. Black women had 3 times increased odds (odds ratio: 2.96 [95% confidence interval: 2.66–3.28]) and Hispanic women nearly 13 times increased odds (odds ratio: 12.89 [95% confidence interval: 10.85–15.30]) of testing, compared with white women. Women with public (odds ratio: 1.74 [95% confidence interval: 1.58–1.91]) and public pending (odds ratio: 6.85 [95% confidence interval: 5.13–9.15]) insurance had increased odds of testing, compared with women with private insurance. After first STI diagnosis, differences according to race/ethnicity persisted but were smaller; after first pregnancy, differences persisted.

CONCLUSIONS: Despite recommendations to screen all sexually active young women for chlamydia, providers screened women differently according to age, race/ethnicity, and insurance status, although differences were reduced after first STI or pregnancy. *Pediatrics* 2011;127:e336–e344

Age, race/ethnicity, and socioeconomic status are the principal coordinates of health disparities in the United States. Among the many conditions associated with disparities, sexually transmitted infections (STIs) may be the most egregious example, with rates of *Chlamydia trachomatis* being 8 times higher among black women, compared with white women.[1] Because most chlamydia infections are asymptomatic[2] and the greatest disease burden is among adolescents and young women,[3] the US Preventive Services Task Force recommends screening of all sexually active women <25 years of age for chlamydia.[4,5] Therefore, clinical adherence to guidelines requires only determination of age and sexual activity to trigger annual chlamydia screening.

Despite the apparent simplicity of the recommendations, chlamydia screening rates are relatively low.[6] This raises the possibility that other factors influence clinicians' screening decisions. Factors that might influence these clinical decisions include different rates of inquiries regarding sexual activity, judgments about chlamydia risk on the basis of race/ethnicity or socioeconomic status, or additional information about infection risk derived from patients' medical records. Especially with the time constraints of busy practices, providers may make decisions on the basis of inadequate information[7] or stereotypes and prejudices,[8,9] which potentially would contribute to differential chlamydia screening. Despite previous studies that elucidated differences in chlamydia screening rates according to sociodemographic factors, none has considered sexual health indicators such as previous pregnancies and STIs and none has accounted for provider-level correlations in screening. Better understanding of screening practices would improve understanding of disease rates and would allow more opportunities for quality improvement, in a setting where we know there are marked racial/ethnic disparities.

This study investigates differences in chlamydia screening according to age, race/ethnicity, and insurance status among adolescents and young women receiving routine health care. Sexual health history, including previous STI diagnoses and pregnancy history, was examined as a modifying factor potentially influencing providers' decisions to screen. In addition, analyses were performed with and without provider-level correlations, to investigate whether screening differences were partially accounted for by provider-specific testing practices.

METHODS

Study Design, Population, and Inclusion Criteria

This study was a retrospective longitudinal cohort analysis using clinical data in the Regenstrief Medical Record System (RMRS) and affiliated hospital billing systems. The RMRS is an electronic data repository servicing 3 major hospitals and >30 clinics in Indianapolis, Indiana.[10] The RMRS routinely captures registration information, orders, medications, laboratory and radiography reports, and other clinical data, including International Classification of Diseases, Ninth Revision (ICD-9), diagnosis codes. For the purposes of this study, RMRS data were linked with billing system data by using a probabilistic matching algorithm using name, date of birth, Social Security number, and race/ethnicity. Probabilistic matching uses likelihood ratio theory and data analysis to establish more-accurate record linkages (eg, it accounts for typographic and other errors that may lead to omitted linkages with deterministic matching approaches). The billing data complemented the RMRS data by adding ICD-9 procedure, Current Procedural Terminology, National Uniform Billing Committee Condition Codes, Logical Observation Identifiers Names and Codes, and Healthcare Common Procedure Coding System codes. Approximately 4% of RMRS visits lacked matching billing data and were included by using only clinical data available in the RMRS.

With the use of this database, a cohort of young women 14 to 25 of age in 2002–2007 was defined. For each woman, visits for which pharmacy or claims/encounter data indicated sexual activity, as defined by the Healthcare Effectiveness Data and Information Set (HEDIS) Chlamydia Screening in Women performance measure, were identified.[11] On the basis of this measure, women are considered to be sexually active if they have been given contraceptives or a billing code specifying a diagnosis or procedure related to contraception, pregnancy (including abortion or miscarriage), STI, or other gynecologic issue related to sexual activity. Although this measure is reported annually through the use of cross-sectional data (evidence of sexual activity and testing must occur during the same calendar year, regardless of the order of occurrence), these data used longitudinal indicators of both sexual activity and testing. Any previous indication of sexual activity was used, not restricting the cohort on the basis of evidence within the same calendar year. This allowed for analyses in which evidence of sexual activity preceded the chlamydia testing date. Visit information defining sexual activity before age 11 was excluded, because this is an age before which clinical information on sexual activity generally is not gathered. In addition, RMRS clinical and laboratory data indicating evidence of sexual activity (eg, pregnancy test) were used regardless of corresponding ICD-9 diagnosis

or Current Procedural Terminology codes.

All visit-level clinical data after the first indication of sexual activity were extracted. Visits in which screening might have occurred were restricted to routine outpatient encounters and visits known not to have occurred in specialty settings, to focus on situations in which providers should consider chlamydia screening. Routine visits were defined by using ICD-9 codes indicating a check-up or well visit.

Visits during pregnancy periods and visits with ICD-9 diagnoses consistent with STIs or STI symptoms were excluded. The following RMRS data were used to define pregnancy periods: gestation, delivery date, delivery-related ICD-9 code, estimated date of confinement, pregnancy-related ICD-9 or RMRS diagnosis code, and/or positive pregnancy test results. For data related to live-birth deliveries with no length of gestation indicated, the period from the coding date to 280 days earlier was designated as a pregnancy period. After these periods were defined, additional pregnancy-related visits were defined if they occurred within 14 days before or after a visit with pregnancy-related codes (~1% of pregnancy-related visits) or if they occurred within 14 days before or after positive pregnancy test results not captured with other pregnancy definitions (<0.1% of pregnancy-related visits). STI symptoms were defined on the basis of the study by Hoover et al,[12] by using diagnosis and procedure codes indicating pelvic inflammatory disease, cervicitis/vaginitis/vulvitis/endometritis, vaginal discharge or other vaginal symptoms, dyspareunia/pelvic pain/abdominal pain, postcoital bleeding/irregular vaginal bleeding, or urinary symptoms. Among women participating in a separate, longitudinal, prospective study of factors associated with STIs, any visits on or after enrollment were excluded, because that study included protocol-related chlamydia testing.

We defined our cohort on the basis of the aforementioned inclusion and exclusion criteria. More than three-fourths (77.9%) of these young women had >1 routine, outpatient, nonspecialty, non–pregnancy-related, non–STI-related visit (mean ± SD: 5.7 ± 5.4 visits). Approximately 70% of the young women had visits that spanned >1 calendar year (mean ± SD: 2.3 ± 1.2 years).

Visits were further restricted to those in which a sexually active young woman would be considered eligible for chlamydia screening on the basis of recommendations for annual chlamydia screening. Therefore, only visits in which a chlamydia test had not been performed in the previous year (N = 44 340 visits) were included. These criteria were selected so that eligible visits would be more representative of women receiving care in settings where screening is indicated and is typically performed. The research protocol was approved by the Indiana University School of Medicine institutional review board.

Measures

Chlamydia Test Outcome Measure

Tests from outpatient, inpatient, and emergency department settings were included both to define the outcome measure of whether testing was performed at an eligible visit and to exclude visits in which a test had been performed in the previous year. Women who met inclusion and exclusion criteria had, on average, 3 chlamydia tests performed during the study period (mean ± SD: 3.1 ± 3.2 tests [range: 0–27 tests]; with exclusion of tests performed within 14 days after another chlamydia test, mean ± SD: 1.2 ± 1.5 tests [range: 0–17 tests]). Women who were tested at least once for chlamydia had, on average, 2 tests performed (mean ± SD: 2.2 ± 2.1 tests; with exclusion of tests performed within 14 days after another chlamydia test, mean ± SD: 1.9 ± 1.5 tests).

Race/Ethnicity

Race/ethnicity was a self-reported measure, as identified at the most-recent clinical visit. If RMRS race/ethnicity data were missing, then race/ethnicity as reported in the billing data was used. On the basis of the prevalent populations in this cohort, the variable was categorized as black, Hispanic, white, or other.

Age

Age was categorized in 2-year increments between 14 and 25 years, to allow for an unconstrained association with chlamydia testing. Age was included as a time-varying variable in regression analyses.

Insurance Status

Insurance status, as an indication of socioeconomic status and access to care, was coded as public, public pending, private, self-pay, or other. Public pending indicates circumstances in which an individual is assessed as being eligible for public insurance but has not yet enrolled because of a lapse in coverage or new eligibility. Other indicates an assorted group of insurance types, each with few visits, including Workmen's Compensation, disability coverage, correctional facility care, and Medicare. Although insurance status data were available through both the RMRS and the billing systems, billing data were used as a default, for 2 reasons, that is, (1) data were more often missing from the RMRS because inclusion relied on presentation of an insurance card at the visit and (2) billing data more likely reflected the insurance that provided reimburse-

ment, as opposed to insurance with lapsed or inadequate coverage for the care sought. When billing data were missing, insurance data from the RMRS were used. When insurance data were missing from both sources, data were imputed from the most-recent visit within 6 months for which data were available. Because insurance status might change over time, a time-varying variable was used.

Stratifying Variables

Variables used in stratified analyses were previous STI and previous pregnancy (both time-varying variables). Previous STI was defined as any positive laboratory result, including chlamydia, gonorrhea, trichomonas, syphilis, and HIV. Previous pregnancy, including abortion or miscarriage, was defined by using laboratory data and other diagnostic data as defined above.

Analyses

Descriptive statistical analyses were performed for 2 related populations. Table 1 reports characteristics of women who met all inclusion and exclusion criteria but not including those with only visits for which tests were performed in the previous year, to reflect individuals in the regression analysis. Table 2 reports the proportion screened for chlamydia among women who met all inclusion and exclusion criteria, including those with visits for which chlamydia tests were performed in the previous year. Each woman was included only once for each year in which she had a routine, outpatient, nonspecialty, non–pregnancy-related, non–STI-related visit. The population for Table 2 was defined to reflect best the annual rates reported by using HEDIS criteria.

TABLE 1 Cohort Characteristics of Study Population in Indianapolis, Indiana, from 2002–2007 ($N = 23\,035$ Individuals)

	n (%)
Age at first visit	
14–15 y	1847 (8)
16–17 y	2718 (12)
18–19 y	3955 (17)
20–21 y	4612 (20)
22–23 y	4959 (22)
24–25 y	4944 (21)
Race/ethnicity	
White	10 548 (46)
Black	8175 (35)
Hispanic	2707 (12)
Other/missing data	1605 (7)
Insurance status	
Private	8237 (36)
Public	11 440 (50)
Public pending	429 (2)
Self-pay	1126 (5)
Other/missing data	705 (3)
>1 insurance type over time	1098 (5)
History of chlamydia	1691 (7)
History of STI	2789 (12)
History of pregnancy	12 267 (53)

TABLE 2 Proportion of Young Women Tested for Chlamydia in Each Calendar Year

	n (%)
Age[a]	
14–15 y	2041 (54)
16–17 y	4454 (63)
18–19 y	6362 (62)
20–21 y	6831 (59)
22–23 y	6797 (57)
24–25 y	5948 (51)
Race/ethnicity	
White	9713 (45)
Black	15 599 (65)
Hispanic	5723 (72)
Other/missing data	1398 (49)
Insurance status[b]	
Private	7721 (45)
Public	22 492 (63)
Public pending	446 (72)
Self-pay	726 (43)
Other/missing data	916 (83)
History of chlamydia[a]	
No	25 327 (54)
Yes	7106 (74)
History of STI[a]	
No	22 928 (53)
Yes	9505 (72)
History of pregnancy[a]	
No	12 001 (53)
Yes	20 432 (60)

Each young woman was included once per calendar year for which she met inclusion and exclusion criteria (≥1 routine, outpatient, nonspecialty, nonpregnancy visit with no reported STI symptoms, after evidence of sexual activity according to HEDIS criteria).

[a] Age and history of chlamydia, STI, or pregnancy were determined at the first visit of the calendar year.

[b] Given the possibility of multiple insurance types at different visits in 1 calendar year, insurance is reported on a hierarchical basis (ie, private, public, public pending, self-pay, and then other/missing data; for example, status was reported as private if there was ≥1 visit with private insurance and public if there was no visit with private insurance but ≥1 visit with public insurance).

A 2-part, random-effects, logistic regression analysis that accounted for repeated visits according to patient and then provider, to adjust for the nonindependence of the data, was performed (Stata 10 [Stata Corp, College Station, TX]). Initial analyses accounted only for individual-level correlations, to identify overall differences in chlamydia testing according to individual characteristics ($N = 22\,903$ individuals). Subsequent analyses accounted only for provider-level correlations, to identify whether provider-level correlations accounted for differences in testing rates ($N = 1040$ providers). Because of the nonnested and unbalanced nature of the longitudinal data (including many individuals with only 1 eligible visit and many individuals who sought care from multiple providers), the model that accounted simultaneously for both individual- and provider-level correlations would not converge. Therefore, separate models for individual- and provider-level random effects were used, with sensitivity analyses for all provider-level analyses in which only 1 visit per individual was included. Because the findings were similar in sensitivity analyses, analyses using all individual visits are presented. All analyses controlled for age, race/ethnicity, and insurance status and were performed with and without stratification according to previous STI and pregnancy status.

RESULTS

Cohort Characteristics

On the basis of HEDIS criteria, one-third of the young women were sexually active by age 14 and nearly 100% were sexually active by age 25. The demographic characteristics were diverse (Table 1) and similar to those of the local population of young women.

TABLE 3 Adjusted Odds of Chlamydia Screening, With and Without Stratification According to Previous STI and Previous Pregnancy, in Indianapolis, Indiana, from 2002–2007

	Odds Ratio (95% Confidence Interval)					
	Individual-Level, Random-Effects Model			Provider-Level, Random-Effects Model		
	All Visits[a]	Visits After First STI[b]	Visits After First Pregnancy[c]	All Visits[d]	Visits After First STI[e]	Visits After First Pregnancy[f]
Age						
14–15 y	0.83 (0.70–1.00)	1.30 (0.46–3.67)	1.13 (0.74–1.74)	0.83 (0.73–0.94)	0.97 (0.49–1.92)	1.15 (0.87–1.53)
16–17 y	1.14 (0.99–1.32)	1.05 (0.62–1.79)	1.26 (0.99–1.61)	1.09 (0.99–1.20)	0.95 (0.64–1.42)	1.36 (1.15–1.60)
18–19 y	1 (reference)	1 (reference)	1 (reference)	1 (reference)	1 (reference)	1 (reference)
20–21 y	0.78 (0.70–0.89)	0.62 (0.44–0.89)	0.92 (0.78–1.09)	0.87 (0.80–0.95)	0.71 (0.55–0.91)	0.97 (0.87–1.08)
22–23 y	0.76 (0.67–0.87)	0.67 (0.47–0.94)	1.07 (0.90–1.27)	0.83 (0.76–0.90)	0.82 (0.65–1.06)	1.02 (0.92–1.14)
24–25 y	0.64 (0.57–0.73)	0.70 (0.49–0.99)	1.01 (0.85–1.20)	0.72 (0.66–0.78)	0.78 (0.60–1.00)	0.96 (0.86–1.07)
Race/ethnicity						
White	1 (reference)	1 (reference)	1 (reference)	1 (reference)	1 (reference)	1 (reference)
Black	2.96 (2.66–3.28)	1.61 (1.21–2.16)	3.74 (3.24–4.32)	1.34 (1.26–1.43)	1.14 (0.93–1.39)	1.46 (1.34–1.59)
Hispanic	12.89 (10.85–15.30)	6.61 (3.39–12.91)	24.00 (19.33–29.79)	1.30 (1.18–1.44)	1.15 (0.76–1.76)	1.45 (1.29–1.63)
Other/missing data	1.50 (1.25–1.81)	1.04 (0.50–2.16)	2.01 (1.43–2.83)	1.15 (1.04–1.28)	1.02 (0.64–1.62)	1.08 (0.88–1.31)
Insurance						
Private	1 (reference)	1 (reference)	1 (reference)	1 (reference)	1 (reference)	1 (reference)
Public	1.74 (1.58–1.91)	1.23 (0.93–1.66)	2.46 (2.14–2.84)	1.03 (0.95–1.11)	0.97 (0.77–1.23)	1.16 (1.04–1.29)
Public pending	6.85 (5.13–9.15)	8.52 (3.74–19.36)	10.82 (7.60–15.40)	1.74 (1.39–2.17)	2.62 (1.37–5.01)	2.04 (1.56–2.68)
Self-pay	0.84 (0.70–1.01)	0.62 (0.37–1.03)	1.14 (0.89–1.46)	0.92 (0.81–1.05)	0.88 (0.60–1.29)	1.02 (0.85–1.23)
Other	14.05 (10.17–19.42)	10.99 (4.54–26.64)	9.30 (5.61–15.37)	1.15 (0.88–1.50)	1.54 (0.71–3.33)	1.10 (0.76–1.61)

[a] $N = 40\,226$ visits and 22 903 individuals.
[b] $N = 4850$ visits and 2788 individuals.
[c] $N = 24\,593$ visits and 12 241 individuals.
[d] $N = 40\,030$ visits and 1040 providers.
[e] $N = 4817$ visits and 458 providers.
[f] $N = 24\,436$ visits and 782 providers.

There were more individuals in the cohort 18 to 25 years of age than 14 to 17 years of age. The majority of individuals had either private (36%) or public (50%) insurance, with only 5% of individuals having >1 insurance type during the study period. Approximately 7% of individuals were diagnosed as having chlamydia and 12% any STI (including chlamydia). Approximately one-half of the young women were pregnant at some point during the study period.

Proportions of Women Screened for Chlamydia According to Demographic and Sexual History Characteristics

In bivariate analyses, several demographic and sexual history characteristics were related to whether a young woman was tested in a particular calendar year if she presented for ≥1 routine, outpatient, nonspecialty, nonpregnancy visit with no reported STI symptoms, after evidence of sexual activity according to HEDIS criteria (Table 2). Although there were few differences according to age, larger proportions of black (65%) and Hispanic (72%) young women were tested, compared with white young women (45%). Similarly, larger proportions of women with public (63%), public pending (72%), or other/missing (83%) insurance were tested for chlamydia, compared with women with private insurance for ≥1 visit during that year (45%). Women with a history of chlamydia, any STI, or pregnancy were tested more often. Overall, more than one-half (58%) of these young women were tested for chlamydia in a particular calendar year (each woman was included only once in each calendar year).

Regression Analyses Controlling for Individual-Level Correlations

In analyses controlling for individual-level correlations, there were decreased odds of chlamydia testing among women 14 to 15 and 20 to 25 years of age, compared with women 18 to 19 years of age (Table 3). Black young women had 2.7 times greater odds and Hispanic young women 9.7 times greater odds of being screened for chlamydia, compared with white women. Women with public and public pending insurance had greater odds of chlamydia testing, compared with women with private insurance. When analyses were stratified according to insurance status (only publicly insured or only privately insured individuals), black and Hispanic women had greater odds of screening, compared with white women (data not shown).

When visits that occurred after a woman's first STI diagnosis were evaluated, there were decreased odds of chlamydia testing among women 20 to 25 years of age but not women 14 to 15 years of age, compared with women 18 to 19 years of age (Table 3). Differences in testing rates according to race/ethnicity persisted after STI diagnosis but were smaller. Women with public

pending insurance had sustained increased odds of testing after first diagnosis, whereas those with public insurance no longer had significant differences in testing rates, compared with women with private insurance.

Among visits after women's first pregnancy, there were no significant differences in testing rates according to age. Differences in testing rates according to race/ethnicity and insurance status, however, were in general more divergent than in the analyses including all visits.

Regression Analyses Controlling for Provider-Level Correlations

With adjustment for provider-level correlations, differences in chlamydia screening rates according to age persisted (Table 3). In stratified analyses of visits after first STI or pregnancy, however, differences in screening rates according to age were no longer statistically significant.

Differences in screening rates according to race/ethnicity and insurance status were reduced or eliminated with adjustment for provider-level correlations, which suggests that provider-level effects might have accounted for these differences in part. Among visits after first STI, the greater odds of screening among minority women were no longer statistically significant; among visits after first pregnancy, differences persisted. Public pending was the only insurance category, compared with private insurance, that had consistently greater odds of screening in provider-adjusted models, which varied little with stratification according to previous STI or pregnancy.

DISCUSSION

Despite long-standing recommendations for annual chlamydia screening in the United States, 42% of sexually active young women, as indicated by HEDIS criteria, did not receive indicated screening. Differences in screening patterns according to age, race/ethnicity, and insurance status demonstrated that providers differentially screened young women receiving routine care. These differences were partially accounted for by provider-level influences. Key historical data such as previous STI or pregnancy also might have influenced screening decisions, because testing differences according to race/ethnicity decreased after STI diagnoses but were accentuated after pregnancies.

Compared with national data reported by the National Committee on Quality Assurance,[6] rates of chlamydia screening were higher in this study population. There are several possible reasons. First, whereas the National Committee on Quality Assurance determined the number of women tested for chlamydia solely on the basis of relevant Current Procedural Terminology and Logical Observation Identifiers Names and Codes codes, this study determined testing rates on the basis of either relevant codes or chlamydia laboratory test result data. Second, clinical sites that provided services in this study are affiliated with a major medical teaching institution where there has been a marked emphasis on research and policies relating to STIs. As a result, there may be elevated institutional awareness of chlamydia screening among clinicians. Despite these differences in rates of screening, differences according to age and insurance status were similar to those reported by the National Committee on Quality Assurance. There were no national chlamydia screening data reported by the National Committee on Quality Assurance with stratification according to race/ethnicity.

These data confirm the roles of age, race/ethnicity, and socioeconomic status as structures for differential health care administration in the United States. However, the reasons why these social statuses are associated with differences in an apparently straightforward clinical decision such as chlamydia screening are unclear. Several explanations could be considered. First, providers may screen women differently on the basis of perceived differences in chlamydia risk. Population-based studies demonstrated higher chlamydia prevalence rates among disadvantaged and minority women.[13,14] Although screening recommendations are based solely on age and sexual activity, clinicians may impose additional risk criteria to avoid screening women with low likelihood of disease. On the basis of this logic, cervical cancer screening rates would be expected to be higher among black women, compared with white women, because cervical cancer rates for black women are double those for white women.[15] However, cervical cancer screening rates for black and white women are nearly identical.[16] Although cervical cancer is clearly associated with sexually transmitted human papillomavirus infection, relatively few women understand this in the context of a cancer screening test, and cervical cancer is much less stigmatized than chlamydia. Therefore, providers may be less likely to screen differentially for chlamydia because of purposeful selection on the basis of perceptions of higher risk among minority women. Second, clinicians may simply be less likely to consider white women in association with a stigmatized STI such as chlamydia. An inference regarding this "reverse health care disparity" is that white women, who typically are more likely to receive routine health screening tests such as mammography, are not considered for chlamydia screening because of the stigma of STIs. Third, between-provider differences in screening rates may occur because each provider's practice focuses on patients with

a characteristic profile.[17] For example, pediatricians are more likely to see women <19 years of age, whereas gynecologists see more women ≥20 years of age. Between-specialty differences in STI screening behaviors were reported in national studies.[18] However, analyses controlling for provider-level influences did not eliminate the associations of age, race/ethnicity, and socioeconomic status in the likelihood of chlamydia screening. Finally, differences in patient preferences may affect screening rates. For example, some women may decline chlamydia screening because of a perceived lack of risk or because of cost or confidentiality concerns. We could find no published findings regarding the frequency with which women decline chlamydia screening.

Previous STI or pregnancy might affect decisions about chlamydia screening because these characteristics confirm a history of sexual activity. Analyses that included STI history showed that most differences in chlamydia screening rates according to age, race/ethnicity, and socioeconomic status disappeared. This supports the earlier suggestion that clinicians incorporate data other than age and sexual activity into screening decisions. Previous pregnancy, however, accentuated differences in screening rates according to race/ethnicity, particularly among Hispanic women. If pregnancies among young women are associated differentially with marriage according to racial/ethnic group[19] and if married women are screened differentially for chlamydia, then this would offer a potential explanation. However, this complex explanation cannot be addressed with data currently available to us.

There are several potential limitations of this study. First, the study's definition of sexual activity might have excluded some young women who were in fact sexually active. The definition of sexual activity is not universally agreed on. For example, definitions may include someone who has ever had sexual intercourse or someone who has had intercourse in a recent time period. To allow for meaningful comparisons of these data with national statistics and for informed policy decisions, the HEDIS definition of sexual activity was chosen and replicated by using the clinical and billing data repositories. Women seeking care for sexual activity-related services outside this system, however, also might have been missed. Similarly, the study's definition of sexual activity might have included some young women who were not sexually active. Although the HEDIS criteria for sexual activity attempt to identify and to exclude instances where an included criterion should be excluded (eg, a pregnancy test performed before an radiograph), it is impossible to anticipate or to exclude all tests, medications, or codes that are not indicative of sexual activity (eg, contraceptives used to suppress menstruation for women with medical conditions caused or exacerbated by menses). Second, an "eligible visit" for chlamydia screening might have been too restrictive. A previous chlamydia test was used to exclude future visits within 365 days, even if the test had not been performed for screening purposes (ie, a test might have been performed in a nonroutine or specialty care setting or during a visit in which a young woman presented with STI symptoms). Current guidelines, however, do recommend more-frequent testing after visits involving symptoms or testing resulting in a chlamydia diagnosis. Therefore, the study focused on visits at which, by the most conservative definition, chlamydia screening was indicated. In addition, because visits with diagnoses consistent with STI symptoms were excluded, these analyses focused on screening, rather than diagnostic, tests. Pregnant women were excluded because pregnancy status raises different decision-related issues for providers. Third, chlamydia tests not recorded in the RMRS database were not included. For example, tests performed at a local sexually transmitted disease clinic or at clinics that specialize in low-cost reproductive health services are not represented. Although it is likely that young women seek care outside their primary medical settings in some circumstances, given the stigma and costs associated with chlamydia testing and disease, this should not have changed providers' approaches to screening. Patients' reports of previous chlamydia testing often are unreliable.[20] Moreover, data on chlamydia testing outside the RMRS are not available to providers in the system, and measures of health care quality such as HEDIS measures do not consider outside-system tests. Finally, these data do not reflect what was discussed between the provider and the patient, including discussions related to sexual activity and risk, but reflect only whether a chlamydia test was performed if there were administrative data indicating sexual activity according to HEDIS criteria. Although these limitations reduce our ability to identify the underlying causes or explanations for differences in chlamydia screening rates according to age, race/ethnicity, and insurance status, they do indicate that differential testing occurs. This differential screening, however, cannot be pardoned by additional perceived or real risk factors, given the asymptomatic nature of the disease, its prevalence and serious health ramifications, and current screening recommendations.

For pediatric providers, these data point to the need to increase our screening practices overall and to cor-

rect our differential screening according to demographic and sexual history characteristics. There are several interventions that increase overall screening rates, using provider education, prompts, and incentives, as well as system-level changes.[21–27] Although the majority of those studies showed improved chlamydia screening rates for intervention groups, overall screening rates remained fairly low. Few if any studies have addressed differences in testing rates. In other words, it is not clear whether the interventions described to date would improve screening among all populations or perhaps among some more than others. Additional research is needed to investigate these questions.

CONCLUSIONS

This study focused on a population of young women at risk for sexually transmitted chlamydia infections. For a substantial proportion of women, no evidence of a chlamydia screening test was identified. Moreover, women's age, race/ethnicity, socioeconomic status, and sexual health history were differentially associated with screening. Although reasons for these differences were not completely elucidated, both individual- and provider-level influences were demonstrated. Providers may begin by considering their own screening practices and what barriers in their practices may contribute to differential screening for sexually active young women. System-level feedback and incentives for standards for health care quality (such as chlamydia screening), as well as ongoing provider education, may help to improve universal screening rates for eligible women.

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