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# *Health Care Access and Follow-Up of Chlamydial and Gonococcal Infections Identified in an Emergency Department*

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***Background:*** **We examined 2 potentially important factors influencing successful treatment of *Chlamydia trachomatis* (Ct) and *Neisseria gonorrhoeae* (GC) infections identified in an emergency department (ED), health care coverage and reporting the ED as a primary source for health care.**

***Methods:*** **Adult patients aged 18 to 35 years attending an urban ED were screened for Ct and GC. Patients testing positive were contacted by Disease Intervention Specialists and notified of their infection status. Analyses focus on infected patients for whom we have treatment and follow-up information. We used generalized linear models with log link and binomial error distribution to estimate risk ratios (RRs) and 95% confidence intervals (CI).**

***Results:*** **Of 5537 patients screened in the ED, 348 (6.3%) tested positive for Ct, 143 (2.6%) tested positive for GC, and 43 (0.8%) tested positive for both. Overall, 20% of infected patients did not receive treatment. Among infected patients with no health care coverage 25% (n = 56) were untreated compared with 15% (n = 47) of patients reporting health care coverage (RR: 1.7, 95% CI: 1.2–2.3). Among patients reporting the ED as a primary source for health care 26% (n = 27) were untreated compared with the 18% (n = 77) reporting receiving health care from non-ED sources (RR: 1.4, 95% CI: 1.0–2.1).**

***Conclusions:*** **EDs often serve as primary care sites for difficult-to-reach populations. We were able to successfully locate and treat the greater part of ED-identified infections. However, one-fifth of infected patients did not receive treatment. ED-based screening programs can benefit from integration with local public health infrastructure to improve notification and treatment services.**

THE MAJORITY OF SCREENING PROGRAMS for *Chlamydia trachomatis* (Ct) and *Neisseria gonorrhoeae* (GC) are based in clinics, schools, and communities.[1] However, a few studies have evaluated the feasibility and acceptability of moving Ct and GC screening into emergency departments (ED).[2–7] All of these ED-based studies have screened using nucleic acid amplification testing (NAAT) technology which requires laboratory support and several days to generate results to confirm a diagnosis. Given the lag time between submitting the biologic specimen for testing and receiving test results, most asymptomatic infections cannot be treated at the time of the ED visit. Consequently, a system to ensure treatment for infected persons must be in place. Relatively little is known about the factors influencing successful treatment of persons in this situation.

Although the studies that have generated the ED-specific screening data have principally relied on dedicated research staff for screening and providing follow-up results and services, the information from these studies can help improve upon current public health prevention and control efforts. Characterizing individuals not likely to seek treatment or follow-up services could help target patients who may benefit from more intensive counseling during screening.

Using data from patients screened for Ct and GC in a busy urban ED, we examined 2 potentially important factors influencing successful treatment, health care coverage and reporting the ED as a primary source for health care. We described the geographic distribution of Ct and GC infections identified in the ED and compared the geospatial distribution of patients who received treatment to those who did not. We also evaluated the influence of distance from a patient's reported home address to the ED on the likelihood of their return for treatment.

## Materials and Methods

### *Study Design*

This short duration prospective cohort study is part of a larger study of patients presenting at the Johns Hopkins Hospital (JHH) Adult Emergency Department in Baltimore, MD, between November 2002 and February 2005. The study comprised 2 phases, a screening phase and a follow-up phase. Patients were eligible for participation in the screening phase of the study if they were between 18 and 35 years of age, English-speaking, and sexually active in the past 90 days. Employees and students of JHH, and patients who were critically ill,

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intoxicated, or presenting for acute psychiatric or STI-related symptoms were excluded. Participants completed a brief demographic and behavioral audio computer-assisted self-interview (ACASI) questionnaire and provided self-collected (urine and vaginal swab) specimens for Ct and GC NAAT. Participants with a positive result who were administered antibiotics during their ED visit were considered treated and not eligible to participate in the follow-up phase of the study. Analyses presented in this article focus on participants who tested positive for Ct or GC during the screening phase of the study and the status of their treatment, regardless of whether they participated in the follow-up phase.

Patients testing positive for Ct or GC were contacted by Disease Intervention Specialists (DIS) and notified of their infection status. DIS are specially trained public health workers primarily responsible for conducting epidemiologic investigations of communicable diseases with an emphasis on STD/HIV. Patients were offered follow-up examination, additional STI testing, and treatment at the JHH General Clinical Research Center (GCRC). Patients were also informed by DIS that they could seek treatment for their infection at the local health department or from their primary health provider. Patients who attended the GCRC were offered participation in the follow-up phase of the research study. Further details of the complete study protocol are described elsewhere.[8]

The Institutional Review Boards of RTI International, The JHHs, and the University of North Carolina at Chapel Hill approved the study protocol. In compliance with Maryland state laws, all Ct and GC infections were reported to the Baltimore City Health Department. Written informed consent was obtained from all study participants.

### *Main Factors of Interest and Outcome Measure*

The first main factor of interest, health care coverage, was dichotomized into no healthcare coverage or having Medicare, Medicaid, a Health Maintenance Organization (HMO), or private insurance. The second main factor of interest, reporting the ED as a primary source for healthcare, was also analyzed dichotomously.

The main outcome measure was not receiving treatment for Ct and GC infections identified in the ED. There were 5 possible outcomes for patients who tested positive during their ED screening: (a) patient received treatment during their ED visit, (b) patient returned to receive treatment at the GCRC, (c) patient was located by DIS and reported receiving treatment at the local health department or from their primary care provider, (d) patient was located by DIS but refused treatment and follow-up services, or (e) DIS was unable to locate the patient. We evaluated the outcome as a dichotomous measure examining those who did not receive treatment because they refused or were not located compared to patients who received treatment, regardless of where treatment was received.

### *Statistical Analysis*

All analyses were conducted using Stata version 8.0 (StataCorp, College Station, TX). We used generalized linear models with log link and binomial error distribution to estimate unadjusted and adjusted risk ratios (RRs) and 95% confidence intervals (CIs) to describe the association between the 2 main factors of interest, health care coverage and reporting the ED as the primary source for health care, and failure to receive treatment.[9]

We determined which factors could potentially modify the association between each of the 2 main factors of interest and not receiving treatment by examining the main associations stratified by the categories of each potential effect measure modifier. We constructed product-interaction terms between the main factor of interest and each effect measure modifier. We included in the starting model those interaction terms with *P*-values less than $\alpha = 0.20$.[10] We then examined variables for potential confounding effects and included in the starting multivariable model those variables which appeared to confound the main association. All potential effect measure modifiers and confounders are listed under covariates in Table 1. We used a backward elimination strategy based on change in estimate criteria to remove variables which did not modify or confound the main associations. Product-interaction terms were removed if their likelihood ratio test *P*-value was greater than $\alpha = 0.10$. Covariates were not retained in the models if their removal changed the main association by less than 10% overall or in any stratum of the interacting variables.[11]

TABLE 1. Distribution of the Main Outcome, Main Factors of Interest and Other Covariates Among Patients Testing Positive for *Chlamydia trachomatis* (Ct) and *Neisseria gonorrhoeae* (GC) Infections in an Emergency Department (ED), Baltimore, Maryland, 2002 to 2005

| | Total, N (%) |
|---|---|
| Main outcome | |
| Disposition of ED-identified infection | |
| Did not receive treatment and follow-up services | 104 (19.6) |
| Received treatment and follow-up services | 428 (80.4) |
| Main factors of interest | |
| Health care coverage | |
| No coverage | 223 (42.0) |
| Medicare/Medicaid/HMO/private | 308 (58.0) |
| Primary source for health care | |
| Emergency department | 105 (19.7) |
| Nonemergency department | 427 (80.3) |
| Covariates | |
| Gender | |
| Females | 344 (64.7) |
| Males | 188 (35.3) |
| Race | |
| African American | 482 (90.6) |
| Non-African American | 50 (9.4) |
| Age | |
| 18–20 | 189 (35.5) |
| 21–25 | 203 (38.2) |
| 26–30 | 87 (16.4) |
| 31–35 | 53 (9.9) |
| Marital status | |
| Never married | 456 (85.7) |
| Married/divorced/widowed | 76 (14.3) |
| Educational attainment | |
| High school or less | 462 (86.8) |
| More than high school | 70 (13.2) |
| Previously diagnosed with Ct or GC | |
| Ever | 239 (45.2) |
| Never | 290 (54.8) |
| Antibiotic use | |
| Within the past 3 mo | 114 (21.5) |
| Not within the past 3 mo | 416 (78.5) |
| Partner diagnosed with STI | |
| Yes or do not know | 161 (30.3) |
| No | 371 (69.7) |

### *Geographic Information Systems Analysis*

We used ArcGIS and Environmental Systems Research Institute's StreetMap 2006 to geocode self-reported residential addresses to physical locations (Environmental Systems Research Institute, Redlands, CA). The geocoded addresses were then projected into North

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American Datum 1983 State Plane Meters and straight-line distance to the ED was calculated by spatially joining the addresses. We evaluated the influence of distance on the likelihood of not receiving treatment, in addition to evaluating distance as a potential confounding variable in our models of the main associations. Graphically, we created a count map of infections within each census block group. To visually compare the distributions of treated and untreated infections based on qualitative factors, we calculated the proportion of untreated infections within each census block group and generated a proportion map. Finally, we calculated Moran coefficients to measure clustering within each census block group.[12] A Moran coefficient close to +1 indicates positive spatial dependence whereas a coefficient close to 0 indicates no spatial dependence.

## Results

### *Overall Population*

A total of 7532 eligible patients were approached to participate, of whom 6195 consented to enroll in the screening phase of the study (82% response rate). A total of 5537 patients completed the ACASI questionnaire and provided a self-collected vaginal swab or urine specimen that yielded a valid result.

### *Study Population Characteristics*

Of the patients screened in the ED, 348 (6.3%) tested positive for Ct, 143 (2.6%) tested positive for GC, and 43 (0.8%) tested positive for both. Approximately two-thirds (65%) of infected patients were female and the majority (91%) were black (Table 1). The average age was 23.2 ± 4.6 years. Only 13% of infected patients reported having more than a high school education and 86% reported never being married. Nearly half (45%) of infected patients reported being previously diagnosed with either Ct or GC, whereas 30% reported having a partner who, or not knowing if their partner, had been previously diagnosed with an STI. A little more than one-fifth (22%) of patients reported using antibiotics in the 3 months before their ED visit.

### *Main Factors of Interest*

Roughly 40% of infected patients reported that they were not covered by Medicaid, Medicare, an HMO, or private insurance (Table 1). In response to the question "Where do you usually go to get your health care?" 20% of infected patients reported the ED as their primary source for health care. Approximately 30% of participants reporting the ED as their primary source for health care reported having health care coverage whereas 65% of those reporting non-ED primary sources reported health care coverage.

### *Outcome: Failure to Receive Treatment for ED-Identified Infection*

DIS followed standard disease notification procedures which involved up to 20 telephone contact attempts and certified mail. If telephone contact was unsuccessful, the DIS sent a notification letter via certified mail. The mean number of attempted DIS contacts was 2.9 ± 2.6 contacts. The median number of days between screening in the ED and notification of results for patients not treated in the ED and whom DIS was able to locate was 16 days (interquartile range 7–52 days).

Overall, 20% of infected patients did not receive treatment. Of the 532 infected patients, 278 (52%) received treatment at the GCRC, 87 (16%) received treatment during their ED visit, and 63 (12%) reported receiving treatment elsewhere (either at the local health department or at their primary care physician). DIS were unable to locate 53 (10%) infected patients, 6 (1%) patients were out of the DIS jurisdiction, 7 (1%) patients were in jail or a rehabilitation facility, 21 (4%) patients were located but refused treatment, and 17 (3%) did not show up for their scheduled GCRC visit. For our analyses, we assumed that patients not located by DIS did not receive treatment for their infection.

TABLE 2. Association Between Health Care Coverage Status and Not Receiving Treatment for *Chlamydia trachomatis* (Ct) and *Neisseria gonorrhoeae* (GC) Infections Identified in the Emergency Department, Crude and Stratified by Antibiotic Use, Baltimore, Maryland, 2002 to 2005

| | No Treatment N (%) | Risk Ratio (95% CI) |
|---|---|---|
| *Main factor of interest* | | |
| Health care coverage | | |
| No coverage | 56 (25.2) | 1.7 (1.2–2.3) |
| Medicare/Medicaid/HMO/private | 47 (15.3) | 1.0 (Ref.) |
| *Stratified by antibiotic use* | | |
| Self-reported antibiotic use in past 3 mo | | |
| Health care coverage | | |
| No coverage | 15 (28.3) | 4.3 (1.5–12.0) |
| Medicare/Medicaid/HMO/private | 4 (6.7) | 1.0 (Ref.) |
| No antibiotic use in past 3 mo | | |
| Health care coverage | | |
| No coverage | 41 (24.4) | 1.4 (1.0–2.1) |
| Medicare/Medicaid/HMO/private | 42 (17.1) | 1.0 (Ref.) |

### *Health Care Coverage Status and Not Receiving Treatment for ED-Identified Infections*

Among infected persons with no health care coverage, 56 (25%) did not receive treatment compared with 15% of infected patients who reported having Medicaid, Medicare, an HMO, or private coverage (RR: 1.7, 95% CI: 1.2–2.3; Table 2). This relationship varied by recent antibiotic use. Among patients who reported using antibiotics in the 3 months before their ED visit, the risk of not receiving treatment was 4 times higher (RR: 4.3, 95% CI: 1.5–12.0) for patients who also reported that they did not have health care coverage compared with patients who reported some type of health coverage and antibiotic use. On the other hand, patients reporting no antibiotic use in the past 3 months and no health care coverage were only 1.4 (95% CI: 1.0–2.1) times as likely not to receive treatment compared with infected patients reporting health care coverage and no antibiotic use. None of the covariates we examined appeared to confound the main association.

### *ED as Primary Source for Health Care and Not Receiving Treatment for ED-Identified Infections*

Among patients reporting the ED as their main source for health care, 27 (26%) did not receive treatment for their infection compared with 18% of infected patients reporting that they usually get health care from a private doctor, a clinic, an HMO, or no usual place (RR: 1.4, 95% CI: 1.0–2.1; Table 3). The association between reporting the ED as the primary source for health care and not receiving treatment also varied by reported antibiotic use. Patients reporting antibiotic use in the 3 months before their ED visit who also reported the ED as their primary source for health care were 3 times as likely (RR: 3.1, 95% CI: 1.4–6.7) not to receive treatment for their infections compared with patients reporting antibiotic use but who reported a non-ED

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TABLE 3. Association Between Reporting the Emergency Department as Primary Source for Health Care and Not Receiving Treatment for *Chlamydia trachomatis* (Ct) and *Neisseria gonorrhoeae* (GC) Infections, Crude and Stratified by Antibiotic Use, Baltimore, Maryland, 2002 to 2005

| | No Treatment N (%) | Unadjusted Risk Ratio (95% CI) | Adjusted* Risk Ratio (95% CI) |
|---|---|---|---|
| *Main factor of interest* | | | |
| Primary source for health care | | | |
| Emergency department | 27 (25.7) | 1.4 (1.0–2.1) | 1.2 (0.8–1.8) |
| Nonemergency department | 77 (18.0) | 1.0 (Ref.) | 1.0 (Ref.) |
| *Stratified by antibiotic use* | | | |
| Self-reported antibiotic use in past 3 mos | | | |
| Primary source for health care | | | |
| Emergency department | 9 (34.6) | 3.1 (1.4–6.7) | 2.5 (1.1–5.5) |
| Nonemergency department | 10 (11.4) | 1.0 (Ref.) | 1.0 (Ref.) |
| No antibiotic use in past 3 mo | | | |
| Primary source for health care | | | |
| Emergency department | 18 (22.8) | 1.1 (0.7–1.8) | 1.0 (0.6–1.6) |
| Nonemergency department | 66 (19.6) | 1.0 (Ref.) | 1.0 (Ref.) |

*Adjusted for healthcare coverage status.

source as their primary health care source. However, among patients reporting no antibiotic use in the 3 months before their ED visit, the risk of not receiving treatment was similar for those reporting the ED as their primary source for health care and those reporting a non-ED source (RR: 1.1, 95% CI: 0.7–1.8). Healthcare coverage was the only covariate that appeared to confound the main association between reporting the ED as the primary source for health care and not receiving treatment for ED-identified infections in both strata of antibiotic use.

### *Geospatial Analysis*

We were able to match 90% of reported addresses to a location. Our count map of chlamydial and gonococcal infections detected in the ED shows weak positive clustering with a Moran coefficient of 0.15 (Fig. 1A). Visual inspection of the count maps for infections that were treated and those not treated reveals similar distributions based on qualitative comparison (Fig. 1B and C). The map of the proportion of untreated infections within each census block provides an objective method to visually compare the spatial distributions of the treatment outcome (Fig. 1D). Furthermore, the median distance to the ED was similar for patients receiving treatment and those who did not with a linear travel distance of 2.66 and 2.89 km, respectively (Wilcoxon rank-sum $P$-value = 0.44).

## Discussion

EDs often serve as primary care sites for difficult-to-reach populations. In our study, we were able to successfully locate and treat the greater part of infections identified in the ED. However, while the majority of patients (80%) received treatment for their Ct and/or GC infection, one-fifth of infected patients did not. We examined factors associated with failure to receive treatment to elucidate ways to ensure treatment for these difficult-to-reach persons. It should be noted that we considered patients who reported receiving treatment whom we did not treat as being treated. We did not confirm their treatment with their private doctors or the local health department.

Our results demonstrate a clear association between patients' lack of health care coverage and the risk of not receiving treatment for an ED-identified Ct or GC infection. This association differs depending

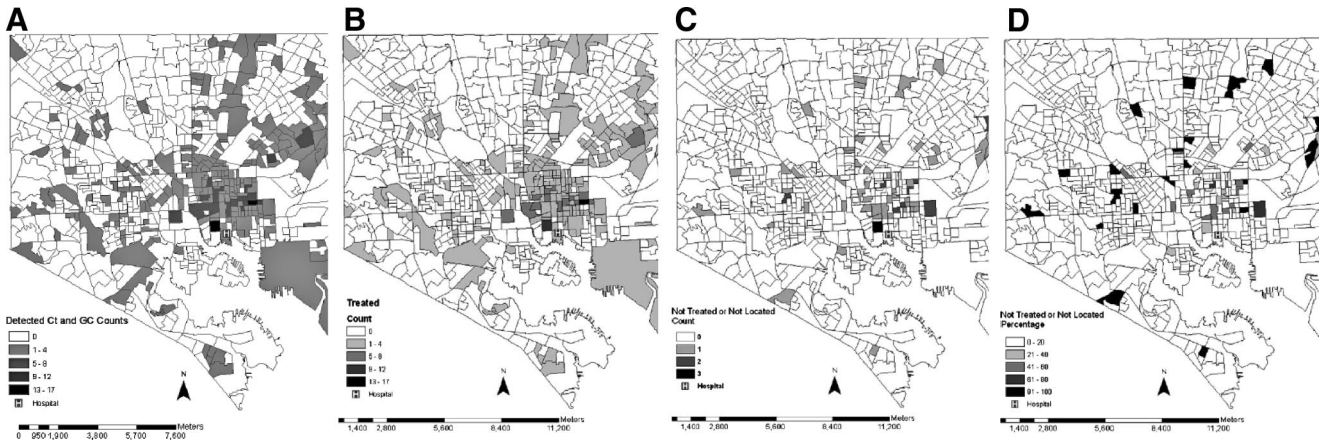


Fig. 1. Maps of *Chlamydia trachomatis* (Ct) and *Neisseria gonorrhoeae* (GC) infections detected in an emergency department among 18- to 35-year-old patients by census block group, Baltimore, MD, 2002–2005. A, Counts of Ct and GC infections. B, Counts of infections receiving treatment. C, Counts of infections not receiving treatment, due to both refusal of treatment and failure to locate patient. D, Proportion of infections not receiving treatment, due to both refusal of treatment and failure to locate patient.

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on recent antibiotic use. Our results also suggest an association between reporting the ED as a primary source for health care and the risk of not receiving treatment for an infection. However, this association may only hold true among patients reporting antibiotic use in the 3 months before Ct and GC screening in the ED.

The varying effect of recent antibiotic use on the relationship between the 2 main factors of interest, health care coverage and reporting the ED as a primary source for health care, and failure to receive treatment is somewhat puzzling. Among patients reporting antibiotic use in the 3 months before their ED visit, 28% of those reporting no health care coverage and 35% of those reporting the ED as their main source for health care did not receive treatment. In the ACASI interview, we defined antibiotics to participants as "pills or tablets taken by mouth that are prescribed by a doctor or nurse to treat a number of bacterial infections including sinus infections, pneumonia, bladder infections, and STIs." It is possible that patients reporting recent antibiotic use assumed their antibiotic use was sufficient for treatment of the current Ct or GC infection. However, given that untreated infections comprised patients who refused treatment and patients whom DIS was unable to locate, it is difficult to determine whether this association is a result of the patient refusing treatment or an artifact of that patient not being located.

Previous studies examining treatment of infections identified in an ED setting have focused mainly on the clinical management of patients with little attention to factors that contribute to the failure to receive appropriate treatment.[13,14] In addition, previous data have been primarily derived from symptom-based testing in the ED and therefore cannot be extended to the majority of infected patients who present without symptoms.[14–17] We excluded patients who were seeking care for STI-related symptoms during their ED visit making our study population more representative of the majority of Ct and GC infections which are asymptomatic. Although 16% of our study population did in fact receive antibiotic treatment during their ED visit, their primary reason for seeking care at the ED was not for STI-related complaints.

Another potential barrier to receiving treatment may have been the lag time between screening in the ED and notifying infected individuals of their results. In our study, the median number of days between screening and result notification was 16 days (interquartile range 7–52 days). Because the biologic specimens collected in the JHH ED were shipped to the University of North Carolina at Chapel Hill's Microbiology laboratory for NAAT processing, our lag time was a little longer than it would have been had testing been performed on site. The median number of days between specimen collection and testing was 6 days (interquartile range 2–13 days). However, the lag time would be similar if the specimens were processed by a commercial laboratory. The lack of a rapid test with sufficient sensitivity and specificity necessitates some lag time if NAATs are used to screen, which eliminates the possibility of on-site treatment for the majority of asymptomatic infections. Nevertheless, the lag time could be significantly shortened if specimens were tested on site using existing NAATs and dedicated laboratory technicians were available to perform the assays and report results.

Although our maps reveal a clear clustering of infections around the ED, the geospatial distribution of treated and untreated infections does not appear to be influenced by proximity to the ED. We did not find an association between distance to the ED and risk of not receiving treatment for the ED-identified infection. We calculated linear distance between self-reported residential address and the ED and not the actual travel distance. Although actual travel distance might have been preferable, given that we did not find an association using linear distance, it seems highly unlikely there would be an association using actual travel distance.

As STI screening programs continue to expand and EDs are utilized more often as screening venues, serious consideration must be given to ensuring treatment of all detected infections. This study demonstrates that it is possible to provide appropriate treatment and follow-up services to a large number of infections identified in an ED setting. Although our study relied on dedicated research staff and resources, there were still patients that we were unable to locate. Follow-up and treatment of ED-identified infections can benefit from integrated partnerships with local health departments in addition to intensive STI counseling for patients at highest risk for not receiving treatment at the time of the screening. Although all patients would benefit from intensive STI prevention and control messages, targeting those at highest risk when they do access health care in the ED may be the only opportunity to intervene with this difficult-to-reach population.

## References


1. Ford CA, Viadro CI, Miller WC. Testing for chlamydial and gonorrheal infections outside of clinic settings: A summary of the literature. Sex Transm Dis 2004; 31:38–51.
2. Finelli L, Schillinger JA, Wasserheit JN. Are emergency departments the next frontier for sexually transmitted disease screening? Sex Transm Dis 2001; 28:40–42.
3. Mehta SD, Rothman RE, Kelen GD, et al. Unsuspected gonorrhea and chlamydia in patients of an urban adult emergency department: A critical population for STD control intervention. Sex Transm Dis 2001; 28:33–39.
4. Todd CS, Haase C, Stoner BP. Emergency department screening for asymptomatic sexually transmitted infections. Am J Public Health 2001; 91:461–464.
5. Monroe KW, Weiss HL, Jones M, et al. Acceptability of urine screening for *Neisseria gonorrheae* and *Chlamydia trachomatis* in adolescents at an urban emergency department. Sex Transm Dis 2003; 30:850–853.
6. Bachmann LH, Richey CM, Waites K, et al. Patterns of *Chlamydia trachomatis* testing and follow-up at a University Hospital Medical Center. Sex Transm Dis 1999; 26:496–499.
7. Silva A, Glick NR, Lyss SB, et al. Implementing an HIV and sexually transmitted disease screening program in an emergency department. Ann Emerg Med 2007; 49:564–572.
8. Rogers SM, Miller WC, Turner CF, et al. Concordance of *Chlamydia trachomatis* infections within sexual partnerships. Sex Transm Infect 2008; 84:23–28.
9. McNutt LA, Wu C, Xue X, et al. Estimating the relative risk in cohort studies and clinical trials of common outcomes. Am J Epidemiol 2003; 157:940–943.
10. Slevin S. Analysis of Contingency Table Data, Logitistic Models. Statistical Analysis of Epidemiologic Data, 3rd ed. New York, NY: Oxford Press, 2004:chap 7.
11. Maldonado G, Greenland S. Simulation study of confounder-selection strategies. Am J Epidemiol 1993; 138:923–936.
12. Garson GD, Biggs RS. Analytic Mapping and Geographic Databases. Newbury Park, CA: Sage Publications, 1992.
13. Levitt MA, Johnson S, Engelstad L, et al. Clinical management of chlamydia and gonorrhea infection in a county teaching emergency department—concerns in overtreatment, undertreatment, and follow-up treatment success. J Emerg Med 2003; 25:7–11.
14. Kelly JJ, Dalsey WC, McComb J, et al. Follow-up program for emergency department patients with gonorrhea or chlamydia. Acad Emerg Med 2000; 7:1437–1439.
15. Kuhn GJ, Campbell A, Merline J, et al. Diagnosis and follow-up of *Chlamydia trachomatis* infections in the ED. Am J Emerg Med 1998; 16:157–159.
16. Chan L, Snyder HS, Verdile VP. A retrospective review of positive chlamydial cultures in emergency department patients. Am J Emerg Med 1996; 14:406–410.
17. Bachmann LH, Pigott D, Desmond R, et al. Prevalence and factors associated with gonorrhea and chlamydial infection in at-risk females presenting to an urban emergency department. Sex Transm Dis 2003; 30:335–339.


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