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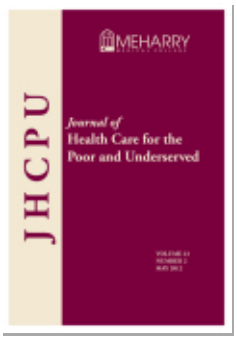

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It Takes At Least Two: Male Partner Factors, Racial/Ethnic Disparity, and *Chlamydia trachomatis* Among Pregnant Women

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Abstract: Chlamydia trachomatis (CT), the most prevalent sexually transmitted infection in the United States, disproportionately infects women and people of color. This study aimed to identify risk factors for racial and ethnic disparities for CT infection, re-infection, and persistent infection among pregnant women. We present a secondary analysis of births from a retrospective cohort study in Syracuse, NY from January 2000 through March 2002. African American women [OR 3.35 CI (2.29, 4.92)], Latin American women [OR 4.35 CI (2.52, 7.48)], unmarried women [OR 7.57 CI (4.38, 13.10)], and teen mothers [OR 3.87 CI (2.91, 5.16)] demonstrated statistically significant increased risk for infection. In multivariate analyses that included male partner variables, father's race/ethnicity but not the mother's race/ethnicity remained statistically associated with CT. Despite near universal rates of screening pregnant women, challenges to CT control remain and reflect barriers to testing and treatment of male partners.

Key words: Chlamydia Trachomatis, racial/ethnic disparity, male partner factors, pregnancy, social determinants.

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Chlamydia trachomatis (CT), the most commonly reported sexually transmitted infection in the United States, demonstrates significant racial and gender disparity.[1] In 2008, there were 341 cases per 100,000 people for New York State.[2] In New York State (1996 to 2008), the rate of infection for African Americans (551.34) was eight times higher and for Latin Americans (240.25) four times higher than the European American (67.59) rate. During this same time period, the female rate for New York State (555.15) was three times the male rate (182.83). In each racial and ethnic category, female CT rates range from nearly two to over three times higher as illustrated by the following rates in New York State (1996–2008): African American females (682.70), African American males (391.43), Latin American females (347.21), Latin American males (123.57), European American females (102.87), and European American males (29.60).[3]

Numerous authors call attention to the finding that the usual demographic and social risk factors for sexually transmitted infection, including multiple partners, lack of barrier protection, alcohol and drug abuse, do not fully explain this racial/ethnic disparity.[4] Hallfors et al. (2007), for example, conclude that "the traditional risk behaviors" do not predict CT infection among African American young adults.[5] The social determinants of elevated rates of CT among people of color suggested in the literature include lack of timely treatment due to lack of health insurance and fiscal constraints of public clinics.[6,7]

Many of the epidemiological studies on CT focus on individual level risk factors of the person being tested for the infection.[8,9] Studies that include an analysis of partner level risk factors call attention to concurrent partnerships, constrained social networks, delays in accessing treatment, and barriers to treatment.[4] Stein et al. (2008) in examining CT infections in a community setting concluded that the race of both the infected person and their partner independently enhanced the predictive value of their model. However, "race" is a self identified social designation. Without further examining the social determinants that may be driving elevated rates of CT, using "race" as a singular risk factor does not further our understanding. It becomes a tautology, which could be stated as: "there is racial disparity in CT therefore the risk factor is race." These authors acknowledge that "the use of race/ethnicity [is] undoubtedly controversial."[10[p.7]]

A Medline search found no studies that address demographic factors of the male partners among pregnant women with CT. In our present healthcare system, among lower income adults who lack health insurance, women have more access to screening and treatment for sexually infections in Title X Family Planning programs and publicly funded prenatal care clinics. In contrast, males who lack health insurance have more limited access to screening and treatment for CT and other sexually transmitted infections. Therefore, studies that include male partner variables can provide important information to reduce rates of infection for both females and males.

The high incidence of CT infection among women is of special concern because women infected with CT or gonorrhea may develop pelvic inflammatory disease, which may lead to infertility, ectopic pregnancy, and chronic pelvic pain, as well as increasing the risk for HIV transmission. In addition, women with CT may be at higher risk

for premature delivery.[2] Pregnant women infected with CT can infect their newborns during vaginal delivery; such infants are then at risk of developing ophthalamia and CT pneumonia.[2] In a 2006 Center for Disease Control and Prevention (CDC) study in prenatal clinics in New York State, the prevalence of CT was 3.5% among pregnant women ages 15–24.[2]

This study employs a retrospective chart review of prenatal and hospital delivery medical charts of women who delivered a live birth at the major birth hospital in Syracuse, NY from January 2000 through March 2002. The goal of the study was to identify risk factors for racial and ethnic disparities for CT infection, re-infection, and persistent infection among pregnant women. We included partner race/ethnicity with maternal race/ethnicity and other maternal risk factors in this analysis. Our analysis further addresses barriers to access for timely treatment and reasons for inadequate treatment of male partners, including poverty, elevated rates of unemployment leading to lack of health insurance, and specific screening methods for males.

Methods

This analysis used a dataset collected for an evaluation of Syracuse Healthy Start, an infant mortality prevention project funded by the federal Health Resources and Services Administration. The data were drawn from chart reviews of the antenatal and hospital delivery charts and linked with the Perinatal Data System (PDS). The PDS is a de-identified population-based birth registry that captures pregnancy and birth information and additional quality improvement data items for use by maternal and child health administrators, planners, and evaluators. Prenatal and hospital charts were reviewed for all women who lived in nine zip codes overlapping the City of Syracuse and delivered a live birth at the major birth hospital from January 2000 through March 2002. One abstraction form was generated for each infant. Prenatal charts were reviewed in out-patient settings, including publicly-funded clinics, high risk referral clinics, and private offices. If a private provider did not grant access to that office's prenatal charts, the review was performed on the prenatal summary transmitted to the hospital for delivery (30% of prenatal charts). The prenatal data contained in the hospital delivery charts included all of the variables considered in this study; therefore, the 30% of prenatal charts that were denied review at the prenatal clinical sites did not affect access to the data. Only prenatal care visits in which some kind of screening test occurred were abstracted. Items abstracted from the prenatal chart included reproductive infection screening tests performed, symptoms, conditions, and treatments. In-patient charts were reviewed at the delivery hospital, and items abstracted included symptoms, conditions, and treatments during the delivery hospitalization, as well as peri-natal, post-natal, and post-partum outcomes.

Chart reviewers, blind to the purpose of the review, were recruited from among the major delivery hospital's obstetrical nursing and para-professional clinical staff, who attended two three-hour training sessions prior to reviewing charts independently. One of the co-authors (KDM) reviewed the first 10 charts a reviewer abstracted and

5% of all other charts. Prenatal chart reviewers were blind to birth outcomes and inpatient chart reviewers were blind to prenatal conditions. All charts were abstracted onto a scannable form (Cardiff Teleform, Plymouth, Michigan) to facilitate data entry.

This project was determined to be a program evaluation by SUNY Upstate and CDC and was therefore given an "exempt" status by the Upstate IRB.

Description of screening program. Staff from Syracuse Healthy Start, Upstate Medical Facility, and the Onondaga County Health Department presented information on screening guidelines and the racial/ethnic disparity in rates of sexually transmitted infections in Syracuse at the Department of Obstetric and Gynecology grand rounds as well as lunch time presentations at private providers' offices. Over 12 of these presentations were made each year, reaching nearly all obstetricians, midwives, and antenatal clinic staff with this information each year.

Definition of variables. *Maternal sociodemographic characteristics.* Maternal receipt of Medicaid insurance (Yes *vs*. No), maternal education (<12 years *vs*. 12 years or higher), maternal employment (No *vs*. Yes) and age (<20 years *vs*. 20 years or older) were coded as dichotomous variables.

Race/Ethnicity. Maternal and paternal race/ethnic background is coded as Latin American, European American (non-Hispanic), African American (non-Hispanic) and Other.

Married and Unmarried births. Among the births in our study, approximately one third were to married women. Unmarried births were divided into two groups: those whose babies' fathers signed and those whose babies' fathers did not sign the Declaration of Paternity, which is an indirect measure of father involvement at the time of the birth. If a new mother is unmarried, she is given a Declaration of Paternity (DP) form by a Vital Records staff member on the morning following her delivery. When the new father fills in and signs the form, his information is entered into the Perinatal Data System database by hospital staff upon the mother's discharge. If the baby's father of the unmarried mother does not sign the DP, paternal demographic information—date of birth, age, race/ethnicity—are not recorded in the PDS.

Re-infection vs. Persistent Infection. We defined persistent infection as positive tests from two or more sequential visits and re-infection as two positive tests with a negative test in between. We defined effective treatment as being a prescription for azithromycin or amoxicillin documented after a positive test.[11]

Male partner variables. This study also looked at the association of maternal CT infection and multiple infections with variables relating to the mothers' relationship to their babies' fathers and the fathers' racial/ethnic background. These variables included: father signing or not signing the DP among unmarried births and paternal race/ethnicity.

Statistical Analysis. We used 2-tailed t-tests for continuous variables and chi-squared tests for discrete and dichotomous variables. Descriptive analyses, both frequencies and cross-tabulations, initially demonstrated which variables posed a statistically significant risk for CT. We compared women with any CT infection during pregnancy versus none, as well as women with multiple CT infections versus one infection. We performed three sets of logistic regression analyses, the first including the mother's variables only and the second including the father's race/ethnicity. In each set of logistic regression analyses we included two models: (1) With mothers of all ages to test the association

of teen maternal age and (2) the second limited to mothers age 20 and older, in order to include high school education as a variable. This second model is limited to mothers age 20 and older in order to avoid the potential bias of mothers who had not completed high school simply due to young age. In the last analysis that included both maternal and paternal data, we performed stratified logistic regression analyses by the mother's race/ethnicity (creating separate models for European American and African American/Latin American mothers) to address the potential bias of the association between the mother's race and the father's race.

Results

Of the 3,109 live births in the dataset, 51 births had no prenatal chart associated with them, a likely indicator that the women had no prenatal care. Of the remaining 3,058 charts of women who had some evidence of prenatal care, 2,909 (95.13%) had complete chart abstraction. Among the 2,909 women with complete information, 2,885 (99%) were screened for CT during pregnancy; 36% were screened at least twice and 22% were screened more than twice. The screening rate did not vary greatly by provider type; among women attending private obstetricians, 932 (98.5%) were screened; among 995 attending a community clinic, 993 (99.8%) were screened; among 447 attending Hospital clinic A, 445 (99.6%) were screened; among 132 attending high-risk clinic, 131 (99.2%) were screened; among 31 attending Hospital clinic B, 30 (96.8%) were screened; and among 371 attending "other" providers, 368 (99.1%) were screened. Among the private obstetricians, 94% of their patients were screened on the first visit; the lowest screening on the first visit was in the community clinic, with 88% of their patients being screened on the first visit.

A total of 263 women were not screened for CT at the first prenatal visit and 24 women were never tested during their pregnancies. At the second prenatal visit, 14.4% (38/263) of those who had not been screened at the first visit were again not screened for CT. Of the 24 women who were never screened for CT, 15 (63%) had only one prenatal visit, while 9 women had multiple prenatal appointments.

Infection, re-infection, and persistent infection. Table 1 presents the characteristics of the women in three CT categories: not infected, infected once, and infected more than once. Their age ranged from 12 to 48 years, with 547 (18.8%) being less than age 20. Among the teens, 129 (23.6%) were European American, 328 (60.0%) were African American, 61 (11.2%) were Latina, and 29 (5.3%) were identified as Other.

Of the 220 women who tested positive for CT at least once during their pregnancy, 148 (67.3%) women were positive at their first prenatal visit with the remaining 72 (32.7%) women found to be infected with CT later in the pregnancy. The 220 women with any CT infection experienced a total of 250 positive CT tests. Of the 25 women with multiple infections, 22 (88%) had two positive tests, 2 (8%) had three positive tests, and 1 (4%) had four positive tests (Table 2). Using our definitions of persistent and re-infections, 14 women had persistent infections, 9 were re-infected, and 2 women showed both persistent and re-infection patterns; 4 had no documentation of a treatment in their chart after their first infection. Three of these four individuals were classified as having persistent infections and one as having a re-infection. Therefore, the overall

Table 1.

SOCIODEMOGRAPHIC CHARACTERISTICS OF PREGNANT WOMEN IN SYRACUSE, NY, ASSOCIATED WITH ONE OR MULTIPLE *CHLAMYDIA TRACHOMATIS* INFECTIONS

Characteristic of Pregnant Women	Not Infected N=2,665 n (%)	Infected Once N=195 n (%)	Multiple Infections N=25 n (%)	Not Tested N=24 n (%)
Maternal race/ethnicity				
European American	1061 (95.4)	37 (3.5)	1 (0)	13 (1.2)
African American	1214 (88.8)	129 (9.5)	17 (1.3)	7 (0.5)
Latin American	171 (85.1)	22 (10.5)	6 (2.9)	2 (1.0)
Other	219 (95.6)	7 (3.1)	1 (0.4)	2 (0.9)
Maternal Age[a]				
<20 yrs	444 (81.2)	81 (14.8)	15 (2.7)	7 (1.3)
>20 yrs	2204 (94.0)	113 (4.8)	10 (0.4)	17 (0.7)
Education[b]				
Less than HS degree	893 (86.8)	110 (10.7)	17 (1.7)	9 (0.9)
More than HS degree	1749 (94.2)	83 (4.5)	8 (0.4)	15 (0.8)
Marital status[c]				
Married	884 (97.5)	10 (1.1)	1 (0.1)	9 (1.0)
Not Married	1661 (88.4)	180 (9.6)	24 (1.3)	15 (0.8)
Unmarried[d]				
with Declaration of Paternity	848 (89.9)	75 (8.0)	14 (1.5)	6 (0.6)
without Declaration of Paternity	813 (86.8)	105 (11.2)	10 (1.1)	9 (0.9)
Baby's father's race/ethnicity				
European American	776 (97.4)	12 (1.5)	0 (0.0)	9 (1.1)
African American	699 (90.9)	58 (7.5)	9 (1.2)	3 (0.39)
Latin American	131 (85.6)	15 (9.8)	5 (3.3)	2 (1.3)
Other	138 (99.9)	0 (0.0)	0 (0.0)	1 (0.1)

[a]For this variable, 18 women were missing complete data
[b]For this variable, 25 women were missing complete data
[c]In this analysis, this included single *vs.* married, but excluded 244 women who were widowed, divorced, or whose marital status was unknown
[d]In this analysis, only women who were single were included

rate of re-infection in this population of pregnant women was 4.1% (9/220). Of the 220 women who were positive at least once for CT, 183 (83.2%) had a documented "test of cure" and 37 (16.8%) did not.

Babies' fathers and prenatal CT infection. Among births in which the babies' fathers' demographic information was reported (all married births and unmarried

Table 2.

FACTORS ASSOCIATED WITH EVER HAVING HAD *CHLAMYDIA TRACHOMATIS* INFECTION DURING PREGNANCY, SYRACUSE, NY, 2000–2002, BIVARIATE ODDS RATIOS (N=2,885 WOMEN TESTED FOR CT DURING PREGNANCY)

Characteristics	Odds Ratio (95% CI)	P value
Maternal race/ethnicity		.0001
African American	3.35 CI (2.29, 4.92)	
Latin American	4.35 CI (2.52, 7.48)	
European American	ref	
Maternal Age		.0001
<20 yrs	3.87 CI (2.91, 5.16)	
20 yrs and older	ref	
Maternal Education		.0001
Less than HS degree	2.73 CI (2.06, 3.62)	
High school or greater	ref	
Medicaid	1.25 CI (0.83, 1.87)	.33
No Medicaid	ref	
Maternal employment status[a]	1.45 CI (0.99, 2.13)	.043
Mother employed	ref	
Not Married	10.6 CI (5.44, 21.33)	0.0001
Married	ref	
Unmarried births:		.047
Without Declaration of Paternity	7.57 CI (4.38, 13.80)	
With Declaration of Paternity	ref	
Paternal race/ethnicity:		.0001
African American	6.20 CI (3.22, 12.17)	
Latin American	9.87 CI (4.47, 22.04)	
European American	ref	

[a]This analysis includes only mothers age 20 and above to control for the fact that teens are less likely to be employed.
CT = *Chlamydia trachomatis*
CI = Confidence interval

births in which the father signed the DP), 85% of European American mothers had European American babies' fathers, 93% of African American mothers had African American babies' fathers, and 72% of Latin American mothers had Latin American babies' fathers. Table 3 presents pregnant women with one CT infection, more than one CT infection, never having a CT infection, and not being tested compared to the race/ethnicity of the baby's father.

Logistic Regression. The initial set of logistic models, with any CT infection during pregnancy as the outcome (Table 4), and maternal variables as risk factors (mother's age,

Table 3.

DISTRIBUTION OF INFANT'S FATHER'S BACKGROUND AMONG MOTHERS WITH *CHLAMYDIA TRACHOMATIS*, SYRACUSE, NY, 2000–2002, N=2,909 (%)

	Paternal race/ethnicity				
Maternal race/ethnicity	**European American (n=797)**	**African American (n=769)**	**Latin American (n=153)**	**"Other" Ethnicity (n=139)**	**Fathers' information missing (n=1051)**
Women infected with CT more than once					
European American	0 (0)	0 (0)	1 (0.1)	0 (0)	0 (0)
African American	0 (0)	7 (0.9)	0 (0)	0 (0)	10 (1.0)
Latin American	0 (0)	1 (0.1)	4 (2.6)	0 (0)	1 (0.1)
"Other"	0 (0)	1 (0.1)	0 (0)	0 (0)	0 (0)
Women infected with CT once					
European American	10 (1.3)	7 (0.9)	1 (0.7)	0 (0)	19 (1.8)
African American	1 (1.0)	46 (6.0)	1 (0.7)	0 (0)	81 (7.7)
Latin American	1 (1.0)	4 (0.5)	12 (7.8)	0 (0)	5 (0.5)
"Other"	0 (0)	1 (0.1)	1 (0.7)	0 (0)	5 (0.5)
Women never infected with CT					
European American	701 (88.0)	74 (9.6)	23 (15.0)	26 (18.7)	238 (22.5)
African American	26 (3.3)	587 (76.3)	14 (9.2)	7 (5.0)	580 (55.2)
Latin American	14 (1.8)	17 (2.2)	85 (55.6)	3 (2.2)	52 (4.9)
"Other"	35 (4.4)	21 (2.7)	9 (5.9)	102 (73.4)	52 (4.9)
Women never tested for CT					
European American	8 (1.0)	1 (0.1)	1 (0.7)	0 (0)	3 (0.3)
African American	0 (0)	2 (0.3)	0 (0)	0 (0)	5 (0.5)
Latin American	0 (0)	0 (0)	1 (0.7)	0 (0)	1 (0.1)
"Other"	1 (0.10	0 (0)	0 (0)	1 (0.7)	0 (0)

CT = *Chlamydia trachomatis*

marital status, race/ethnicity, and education) demonstrated a significant association of infection with the mother's race/ethnicity (African American/Latin American combined as one variable *vs*. European American), marital status (not married *vs*. married), and mother's age (less than 20 years *vs*. 20 years and over). In the analysis including only mothers age 20 and over, the mother's race/ethnicity (African American/Latin American *vs*. European American), marital status (not married *vs*. married), and not completing high school were significantly associated with any CT infection.

Table 4.

FACTORS ASSOCIATED WITH *CHLAMYDIA TRACHOMATIS* INFECTION, USING MATERNAL DEMOGRAPHIC INFORMATION ONLY, MULTIVARIATE LOGISTIC REGRESSION, SYRACUSE, NY, 2000–2002

	Odds Ratio	95% CI	P value
1a) For All Mothers (n=2,885):			
Maternal Race/Ethnicity	2.18	(1.50, 3.17)	.0001
African American and Latin American	ref		
European American			
Marital Status	3.74	(2.10, 6.65)	.0001
Not married	ref		
Married			
Maternal Age	2.49	(1.84, 3.37)	.0001
<20 yrs	ref		
20 yrs or older			
1b) For maternal age 20 yrs and older (n=2,344):			
Maternal Race/Ethnicity	1.61	(1.03, 2.50)	.04
African American and Latin American	ref		
European American			
Maternal Education	1.39	(1.07, 1.80)	.001
Less than HS	ref		
HS degree or more			
Marital Status	3.54	(1.91, 6.58)	.001
Not married	ref		
Married			

CI = Confidence interval

The second set of logistic models (Table 5), also with any CT infection during pregnancy as the outcome, includes the babies' fathers' race/ethnicity (African American/Latin American *vs.* European American) and the maternal variables described above. This analysis included only births in which the father's information was listed; the sample for this analysis was 1,843 births. Among all women and among women ages 20 and older, the addition of the father's race/ethnicity to the logistic regression made the mother's race/ethnicity statistically insignificant.

Because the race/ethnicity of babies' mothers and babies' fathers are significantly associated, we conducted logistic regression analyses stratified by mother's race/ethnicity. Among European American mothers, African American/Latin American fathers remained significantly associated with CT infection (Odds Ratio [OR] 3.87, Confidence Interval [CI] 1.46, 10.15, $p<.006$). Among African American/Latin American mothers, father's race was not significant (OR 2.53, CI .584, 10.97, $p<.21$).

Table 5.

FACTORS ASSOCIATED WITH *CHLAMYDIA TRACHOMATIS* INFECTION, USING MATERNAL AND PATERNAL DEMOGRAPHIC INFORMATION, MULTIVARIATE LOGISTIC REGRESSION, SYRACUSE, NY, 2000–2002, CONDUCTED AMONG BIRTHS IN WHICH PATERNAL INFORMATION WAS LISTED

	Odds Ratio	95% CI	P value
2(a). For All Mothers (n=1,843):			
Maternal Race/Ethnicity	1.09	(0.54, 2.21)	.81
African American and Latin American	ref		
European American			
Marital Status	3.95	(1.96, 7.79)	
Not Married	ref		.0001
Married			
Maternal Age, y		(1.47, 3.68)	.003
<20 yrs	2.32		
20 yrs or older	ref		
Paternal Race/Ethnicity	3.64	(1.57, 8.44)	.0026
African American and Latin American	ref		
European American			
2(b). For maternal age 20 yrs and older (n=1,598):			
Maternal Race/Ethnicity	0.94	(0.41, 2.11)	.8742
African American and Latin American	ref		
European American			
Maternal Education	1.68	(1.17, 2.42)	.0051
Less than HS	ref		
HS degree or more			
Marital Status	3.10	(1.48, 6.46)	.0026
Not Married	ref		
Married			
Paternal Race/Ethnicity	3.15	(1.20, 8.29)	.0199
African American and Latin American	ref		
European American			

CI = Confidence interval

Discussion

Pregnant women, in this study, remain at increased risk for CT infection, persistent infection, and re-infection. CT testing is rarely performed universally; with pregnancy, however, such selection bias is reduced. In the analysis presented in this article, over 98% of women were tested at least once during pregnancy. This testing follows CDC and the American College of Obstetricians and Gynecologists (ACOG) guidelines,

both of which recommend that obstetrical providers screen women for CT at their first prenatal visit.[11] If women are almost universally screened and treated during pregnancy, but become re-infected, a likely reason is that they are being re-infected by their male partners, who may lack access to screening and treatment. The proportion of pregnant women with any CT infection among those screened was 7.6%, which is over two times the CT rate among pregnant women in New York State.[2] Further, multiple infections with CT point to the possibility that sexual partners are not being fully screened or treated.[12,13] The racial and ethnic disparity in CT infection among women in our sample is striking; among women who were screened, 3.5% of European Americans compared with 9.5% of African Americans and 10.5% of Latin Americans had at least one CT infection. Among the women with one CT infection, those with African American male partners were over 6 times as likely and those with Latin American babies' fathers were nearly 10 times as likely to be infected, compared with women whose partners were European American. Among the 25 women with more than one CT infection, 9 of the babies' fathers were African American, 5 were Latin American and among 11 of the women the babies' fathers' information was missing. As the discussion below outlines, the context and the likely reasons for these disparities are poverty, segregation, skewed sex ratios, barriers to access to health insurance and sexually transmitted infection treatment, and the type of CT screening used for men.

Contextual factors of racial disparity. This section examines the social determinants that potentially increase the infection rate and decrease the access to treatment among men of color. In previous studies of racial disparity, our research team found that adding social or environmental variables to a logistic model changed the "race" variable from significantly associated with the outcome to being not significantly associated. For example, in a study of intrauterine growth restriction (IUGR), African American mothers were associated with higher IUGR in bivariate analyses.[14] When we added mother's residence near a supermarket to the logistic model, race became non-significant. A second study, on post neonatal death, found that the infants of African American mothers had significantly higher post neonatal deaths in a bivariate analysis. When we added whether the babies' fathers had signed the declaration of paternity, an indirect measure of paternal involvement at the time of the birth, the racial disparity was eliminated.[15] In the study described in this article, when we added the male partner's race/ethnicity the mothers' race/ethnicity became non-significant. This indicates that male partner risk factors, as a source of infection and re-infection, may help explain the racial and ethnic disparity among the women.

Concurrent Partnerships and Skewed Sex ratios. African American males, in a study conducted in a sexually transmitted diseases (STD) clinic in upstate New York, expressed their belief that it was within normal behavior for males to have more than one sexual partner and that these partners can be concurrent, but that it was less acceptable for females.[16] In a different study of adolescent sexual networks, African American males were almost eight times more likely to have multiple sexual partners than to be abstainers, compared to their European American-non-Hispanic male counterparts.[17] In previous articles, members of our research team called attention to the finding that concurrent partnerships, in which a male has two or more intimate relationships simultaneously, occur in a demographic context in which females outnumber males due

to disproportionate incarceration.[6,15] In Syracuse, New York, the setting of this study, the 2000 U.S. Census demonstrated that between the ages of 25 and 29 for every 100 African American men there were 150 African American women. In the European American Syracuse population in that age group, the numbers of males and females were nearly equal. Adamora and her colleagues also call attention to racial segregation of neighborhoods, which promotes the formation of sexual networks along racial lines as a risk factor for racial disparity in sexually transmitted infections.[18] Women of color who live in this situation are well aware of the link between the dearth of men and concurrent partnerships, as illustrated by the following quote:

> It's hard because men have it easy. They have two to three women per man, so it's very easy for him to not stay committed. A woman like me is looking for commitment and will try almost anything just to keep that commitment going. . . . I'm gonna accept this BS he's giving me because . . . without him . . . it's gonna be hard for me to find someone else to [be with] . . . seeing it as, "if I let him go, this [other] woman's gonna have him." . . . I don't want to be alone. (African American woman, Syracuse, New York 2003)[19]

Barriers to STD screening and treatment among men. Due to fiscal constraints, the public STD clinic providing free treatment to the Syracuse community is open eleven hours a week.[20] A survey conducted by this STD clinic found that patients often had to wait seven to ten days from the onset of symptoms until effective treatment; many continued to have unprotected sex while waiting to be treated, thus potentially exposing other partners to STDs.[6] Additionally, the clinic is only able to remain open after-school on Thursdays (until 4:30 pm), even though teens have elevated risk, as demonstrated by this study.[20] Further, the 2000 U.S. Census found that among Syracuse men aged 20 to 54, 13% of African Americans and 15% of Latin Americans, compared with 6% of European Americans were unemployed. Employment is the most common mechanism by which individuals receive health insurance. For men without health insurance, the public STD clinic may be their main source of treatment. Some men with STD symptoms visit emergency departments for testing; unfortunately, they usually receive a written prescription for medication that they may not be able to afford to fill.[6] An additional free clinic for male reproductive health operates twice per month in the evening which, while helpful, is insufficient to meet the need for STD screening and treatment among low income, uninsured individuals.

Poverty. In 2000, 27% of Syracuse European Americans fell below the Federal Poverty level, compared with 39% of African Americans and 50% of Latin Americans. Syracuse also has the second highest Latino child poverty rate compared to other cities in the United States.[21] When the baby's father's information was missing, in unmarried births where the male partner had not signed the Declaration of Paternity, CT was elevated. We cannot determine the baby's father's background or circumstances when he is not listed at all. Nevertheless, in 73% (8 of 11) of births in which the baby's father's information was missing and the mother was infected with CT more than once, the mother was covered by Medicaid insurance, which indicates that her income was below 200% of the Federal Poverty level. It is likely, therefore, that many of the "missing" babies' fathers were also impoverished.

Urethral swab for male screening. In a focus group in Syracuse among men of color, the participants expressed considerable fear of what they described as a "Q-tip," more formally known as urethral swab, as strongly prohibitive to going to the local public STD clinic. The urethral swab to diagnose male CT infection was perceived by the men to be painful as it involves inserting a cotton tipped swab 2 to 4 cm inside the urethra and rotating the swab. A non-invasive, but more costly, method collects urine for testing and is significantly more accurate in detecting CT infection in men. A Baltimore-area clinic estimated the cost of each test as: $20 for the urethral swab, compared with $46 for the urine test.[22] Due to fiscal constraints the cheaper option, although more painful and less accurate, is more commonly used. By saving money on the method of detection when using urethral swab or not investing in more accessible screening and treatment, we may instead be shifting the cost and the burden of repeated infections onto women.

Limitations of this study. There were several limitations of this study in drawing conclusions from a secondary analysis. First, we defined effective treatment by documentation of appropriate antibiotic therapy in the medical chart, but this documentation does not necessarily correlate to a patient accessing and completing the drug regimen. Second, it is not possible to be certain that the baby's father was the mother's current sexual partner or the sexual partner responsible for CT infection. A Medline search revealed no studies examining pregnant women and the number of their sexual partners during pregnancy and this is a potential area of future research.

Recommendations. CDC and ACOG guidelines emphasize the importance of re-testing because many women who are treated for CT acquire another infection within a few months. We found that of the 220 women who were positive at least once for CT, 183 (83.2%) had a subsequent CT test and 37 (16.8%) did not. The analyses presented in this article call attention to the importance of understanding CT as a disease of two or even more people. *A test of cure in one partner is therefore completely insufficient.* The CDC guidelines recognize the risk of re-infection as "occur[ring] because the patient's sex partners were not treated or because the patient resumed sex with a new partner infected with *C. trachomatis*."[11] In light of the difficulties of adequate partner treatment, the CDC recognizes that expedited partner treatment may be appropriate and cites growing evidence for this practice.[11] U.S. Physicians have been shown to use patient-delivered partner therapy for CT in practice, but rarely do so consistently and tend to not implement it with African American female patients, which is a concern considering it was a risk factor identified in this study.[23] An increasing number of studies have demonstrated expedited partner therapy increases the percent of partners notified, which could halt, or at the very least slow, the cycle of re-infection among sexual partners.[24] On October 21, 2008, New York Governor Patterson signed a bill into law that would allow primary care providers caring for individuals infected with CT to write a prescription in the name of the infected person's partner for antimicrobial treatment. The patient would then be expected to give his/her partner the prescription. This bill also provides liability protection for physicians, who are prescribing treatment without consulting with the patient. However, for uninsured individuals the cost of such medication may still remain a barrier. These individuals would need to obtain treatment from the public STD clinic.[25]

The vast majority of obstetrical providers caring for women in this study were

meticulous in screening and treating their pregnant patients for CT. Thus, the source of the racial and ethnic disparity in CT infection and re-infection was not in the clinical care of the pregnant women. Despite the success of the screening program, re-infections occurred. The challenges that remain include risk factors among the male partners and inadequate partner treatment. Moreover, it was the men of color who were much more likely to experience barriers to adequate screening and treatment. Thus programs that undertake to address the adequacy of male partner treatment must take into account the discrimination and disadvantage facing impoverished male partners.

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