

# Public Health Briefs

## An Epidemic of Congenital Syphilis in Jefferson County, Texas, 1994–1995: Inadequate Prenatal Syphilis Testing After an Outbreak in Adults

### ABSTRACT

**Objectives.** After a syphilis epidemic in Jefferson County, Texas, in 1993 and 1994, congenital syphilis prevalence and risk factors were determined and local prenatal syphilis screening practices were assessed.

**Methods.** Medical records were reviewed, pregnant women with syphilis were interviewed, and prenatal care providers were surveyed.

**Results.** Of 91 women, 59 (65%) had infants with congenital syphilis. Among African Americans, the prevalence per 1000 live births was 24.1 in 1994 and 17.9 in 1995. Of the 50 women with at least 2 prenatal care visits who had infants with congenital syphilis, 15 (30%) had received inadequate testing. Only 16% of 31 providers obtained an early third-trimester syphilis test on all patients.

**Conclusions.** Inadequate prenatal testing contributed to this outbreak of congenital syphilis. (*Am J Public Health*. 1999;89:557–560)

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Syphilis during pregnancy can cause miscarriage, stillbirth, prematurity, or multi-system infection in live-born infants.<sup>1</sup> In June 1995, the Pan American Health Organization (PAHO) began a campaign to reduce the prevalence of congenital syphilis in the Americas to 0.5 cases per 1000 live births by means of early screening and rapid treatment during pregnancy.<sup>2</sup> Parts of the United States have congenital syphilis rates above the PAHO goal.

Jefferson County, Texas, with a population of approximately 250 000 people, experienced an epidemic of primary and secondary syphilis during 1993 and 1994. Following an intensive control effort, the primary and secondary syphilis rate declined from more than 200 cases per 100 000 persons in 1994 to fewer than 100 in 1995. However, because there were still numerous congenital syphilis cases, we began an investigation in September 1995 to determine the prevalence of congenital syphilis and coinfection with HIV, to identify risk factors for congenital syphilis, and to assess prenatal syphilis screening practices.

### Methods

We identified women who lived in Jefferson County, Texas, gave birth during 1994 or 1995, and had documented reactive non-treponemal and treponemal tests (rapid plasma reagin [RPR] and micro-hemagglutination antibody to *Treponema pallidum*) during pregnancy or at delivery. Sources for identifying pregnant women with syphilis included the local sexually transmitted disease/HIV prevention program's congenital syphilis case reports and computer database of reactive syphilis serological tests, the computerized statewide Texas syphilis morbidity registry, medical records from county sexually transmitted disease clinics and prenatal

care providers, and discharge data (*International Classification of Diseases, Ninth Revision [ICD-9]* codes 090.0 to 090.9 for congenital syphilis<sup>3</sup>) from the 5 major maternity hospitals serving the county. Hospital medical records of these women and their infants were reviewed as well as the infants' birth certificates.

An infant was classified as meeting the Centers for Disease Control and Prevention (CDC) surveillance case definition for presumptive congenital syphilis if he or she was born to a woman who had untreated or inadequately treated syphilis during pregnancy or at delivery.<sup>4</sup> The number of live births in 1994 and 1995 to women residing in Jefferson County was obtained from the Texas Department of Health's Bureau of Vital Statistics. Prevalence of congenital syphilis (number of cases per 1000 live births) was calculated by race for 1994 and for 1995 through the first week in October.

Two female syphilis field workers conducted 30-minute in-person interviews with women who had syphilis during pregnancy or at delivery. Attempts were made to contact all eligible women by telephone calls or field visits to homes, high schools, and local jails. Each participating woman signed a written consent form. Interviewers asked each

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woman, "In general, during your pregnancy, was the baby wanted?"

Characteristics of women with syphilis during pregnancy who had infants with congenital syphilis were compared with those of women with syphilis whose infants did not have congenital syphilis by means of the  $\chi^2$  test. Using backward elimination, we constructed a multivariate logistic regression model from potential confounders and variables found to be significant by univariate analysis conducted with SAS software (SAS Institute, Inc, Cary, NC). The chunk test was used to evaluate interaction terms.<sup>5</sup>

A survey was mailed to the 33 prenatal care providers in Jefferson County asking them to describe their syphilis screening practices.

## Results

### Review of Medical, Prenatal, and Syphilis Program Records

We identified 117 women who had reactive syphilis serological tests during pregnancy or at delivery in 1994 and 1995. Four women with persistent titers of 1:1 or 1:2 after adequate treatment were excluded. Twenty-two women who had reactive syphilis tests during pregnancy could not be located to confirm that an infant had been born and were excluded. Of the 91 remaining women, 59 (65%) gave birth to infants with congenital syphilis. Fifty-three (90%) of the 59 women were African American, 4 (7%) were non-Hispanic White, and 2 (3%) were Hispanic. Of the infants with congenital syphilis, 12 were identified by examination of hospital discharge diagnoses and had not been reported previously to either the county or the state.

The prevalence of congenital syphilis per 1000 live births in Jefferson County was 11.3 in 1994 and 7.9 in 1995. Among African Americans, the prevalence of congenital syphilis per 1000 live births was 24.1 in 1994 and 17.9 in 1995. Corresponding rates among Whites were 1.2 in 1994 and 1.7 in 1995, and among Hispanics, 5.7 in 1994 and 0 in 1995.

The records of the 59 women whose infants had congenital syphilis were examined to determine why their infants had the disease. Nine women (15%) had received no or inadequate prenatal care (care starting at 36 weeks' gestation or later or consisting of only one visit). Of the 50 women who received prenatal care, 16 (32%) had a delay of 1 month or more from the date of a reactive test to syphilis treatment. Ten (20%), including 7 with early syphilis, had a

decrease of less than 2 dilutions in the titer during pregnancy (a 2 dilution drop in the titer is the amount considered necessary by the CDC to document adequate response to therapy by time of delivery).<sup>6</sup>

Seven women (14%) with prenatal care either were not tested for syphilis or were tested fewer than 30 days before delivery, too late for effective treatment. Eight women (16%) who were tested early during prenatal care initially had nonreactive RPR tests. Despite receiving continued prenatal care, they were not retested until delivery, at which time their RPR tests were reactive. Seven (14%) had nonreactive syphilis tests performed early during prenatal care and again during the third trimester but had reactive tests at delivery, and 2 (4%) had received erythromycin therapy, which is inadequate treatment for syphilis during pregnancy.<sup>6</sup> Of the 50 women who made at least 2 visits for prenatal care, only 27%

received syphilis tests during the third trimester at least 30 days before delivery.

Three maternal characteristics were associated with the birth of an infant with congenital syphilis: having no prenatal care, having the initial RPR test after the first trimester, and having positive results on a maternal or infant toxicological urine test for cocaine (Table 1). Women who did not receive prenatal care were more likely than women who did receive prenatal care to have positive results on a urine cocaine test or to have infants with positive results on a urine cocaine test (71% vs 14%; relative risk [RR] = 5.0, 95% confidence interval [CI] = 2.5, 10.1). Women aged 20 years or older were more likely than younger women to have positive results on a urine cocaine test or to have infants with positive results on a urine cocaine test (24% vs 0%;  $P = .003$ ). In the multivariate analysis, 2 risk factors were independently associated

**TABLE 1—Characteristics of 91 Women With Syphilis During Pregnancy: Jefferson County, Texas, 1994–1995**

	No. <sup>a</sup>	No. (%) Delivering Infants With Congenital Syphilis	Relative Risk (95% Confidence Interval)
Year of delivery			
1994	56	40 (71)	1.3 (0.9, 1.9)
1995	35	19 (54)	Reference
Age, y			
20+	68	48 (71)	1.6 (1.0, 2.5)
13–19	22	10 (45)	Reference
Race			
Black	84	53 (63)	0.7 (0.5, 1.0)
Other	7	6 (86)	Reference
Marital status			
Single, never married	71	45 (63)	1.0 (0.6, 1.6)
Separated, divorced	7	5 (71)	1.1 (0.6, 2.1)
Married	11	7 (64)	Reference
Education, y			
<12	44	26 (59)	0.8 (0.6, 1.1)
12+	41	29 (71)	Reference
Insurance			
None	8	6 (75)	1.3 (0.6, 2.8)
Medicaid	76	49 (64)	1.1 (0.6, 2.2)
Private	7	4 (57)	Reference
Initiation of prenatal care			
No prenatal care	7	7 (100)	1.9 (1.4, 2.8)
Third trimester	14	10 (71)	1.4 (0.9, 2.2)
Second trimester	34	22 (65)	1.3 (0.8, 1.9)
First trimester	29	15 (52)	Reference
Initial serological test			
No test before delivery or initial test <30 d before delivery	18	18 (100)	2.2 (1.5, 3.3)
Second or early third trimester	42	27 (64)	1.4 (0.9, 2.2)
First trimester	31	14 (45)	Reference
Maternal or infant urine test for cocaine <sup>b</sup>			
Positive result	17	15 (88)	1.5 (1.1, 2.1)
No documentation	34	21 (62)	1.1 (0.7, 1.6)
Negative result	40	23 (58)	Reference

<sup>a</sup>Numbers for some characteristics do not add up to 91 because of missing data.

<sup>b</sup>Maternal urine test either during pregnancy or at delivery.

with having an infant with congenital syphilis: (1) initial RPR test after the first trimester (odds ratio [OR] = 3.5; 95% CI = 1.2, 10.0) and (2) maternal age 20 years or older at delivery (OR = 5.5; 95% CI = 1.6, 19.4). Interaction terms did not contribute significantly to the model.

### *In-Person Interviews*

Between November 1995 and February 1996, 59 (65%) of the 91 eligible women with syphilis during pregnancy were interviewed. Eight women (9%) refused to be interviewed; 12 (13%) had moved and could not be located; and 12 (13%) could not be found despite 4 visits to each home. Of the 59 women interviewed, 34 (58%) gave birth to infants with congenital syphilis and 25 (42%) did not. The women who were interviewed and those who were not did not differ significantly in age, education, type of health coverage at delivery, whether they received prenatal care, or week of their initial syphilis test. However, interviewed women were less likely than those not interviewed to give birth to an infant with congenital syphilis (16% vs 42%;  $P = .02$ ) and to be African American (82% vs 98%;  $P = .01$ ).

Most demographic, social, and health care factors were not associated with having an infant with congenital syphilis. There were no significant differences in reported number of prenatal care providers, number of prenatal care visits, number of missed prenatal care appointments, type of prenatal care provider (i.e., office- vs clinic-based), or use of emergency room services during pregnancy between women who gave birth to infants with congenital syphilis and those who did not (data not shown). Those women who stated that they wanted their pregnancies, however, were less likely than those who did not to give birth to an infant with congenital syphilis (Table 2), as were women among the subgroup of those who received prenatal care (50% vs 86%; RR = 3.5; 95% CI = 0.6, 22.3), but the relationship was not statistically significant because of small numbers. Of the 3 women who reported exchanging sex for money or drugs during pregnancy, 2 gave birth to infants with congenital syphilis.

Of the 59 women interviewed, 51 (86%) reported being offered HIV tests during pregnancy or at delivery. The results of these tests were documented for 47 of the women; 2 (4%) were HIV-seropositive. One woman with a positive HIV test result gave birth to an infant with congenital syphilis.

### *Provider Survey*

Thirty-one (94%) of the 33 prenatal care providers in Jefferson County responded

**TABLE 2—Self-Reported Characteristics Associated With Congenital Syphilis Among 59 Women With Reactive Syphilis Serological Tests During Pregnancy or at Delivery: Jefferson County, Texas, 1994–1995**

	No.	No. (%) Delivering Infants With Congenital Syphilis	Relative Risk (95% Confidence Interval)
Telephone in house			
Yes	46	26 (57)	0.9 (0.6, 1.5)
No	13	8 (62)	Reference
Attended church during pregnancy			
Yes	39	21 (54)	0.8 (0.5, 1.3)
No	20	13 (65)	Reference
Visited emergency room during pregnancy			
Yes	27	17 (63)	1.2 (0.8, 1.8)
No	32	17 (53)	Reference
Visited emergency room for problem with pregnancy			
Yes	16	10 (63)	1.1 (0.7, 1.8)
No	43	24 (56)	Reference
Pregnancy was wanted			
Yes	50	26 (52)	0.6 (0.4, 0.8)
No	9	8 (89)	Reference
Initiation of prenatal care <sup>a</sup>			
No prenatal care	4	4 (100)	2.4 (1.6, 3.5) <sup>b</sup>
Second or third trimester	16	14 (88)	2.1 (1.4, 3.2)
First trimester	38	16 (42)	Reference

<sup>a</sup>Response missing for 1 woman.

<sup>b</sup>Confidence interval may be an underestimate because of small cell size.

to the mail survey. Two thirds of the responding providers reported having seen at least 1 pregnant patient with a reactive syphilis test during the previous year. According to Texas law, all prenatal care providers should routinely obtain an RPR test at the first prenatal care visit. Nine providers (29%) stated that they had not obtained a second RPR on any patient before delivery. Eleven (35%) obtained a second RPR if a prenatal patient had a reactive initial RPR or if they suspected that the patient was at high risk (e.g., if the patient had multiple sex partners). Eleven providers (35%) obtained a second RPR on all their patients, but only 5 (16% of the 31 respondents) regularly ordered such tests on or before the 32nd week, the latest date at which an off-site test can be done to ensure adequate treatment before a term birth at 37 weeks' gestation.

### **Discussion**

In 1994, the prevalence of congenital syphilis in Jefferson County was 16 times higher than the overall Texas rate of 0.73 per 1000 live births, 19 times higher than the US rate of 0.6 per 1000 live births,<sup>7</sup> and 23 times higher than the PAHO goal of 0.5 per 1000 live births.<sup>2</sup> Even considering the relatively low specificity of the CDC surveillance definition for case ascertainment, these are unac-

ceptably high rates, given that syphilis during pregnancy is easily diagnosed and treated.

Our investigation supports previous US studies that have shown a strong correlation between syphilis, cocaine use, and HIV infection in pregnant women.<sup>8–10</sup> Approximately 4% of our study population had positive HIV tests, compared with 0.1% (3/2565) of all Jefferson County women who gave birth to infants during 1994 (0.2% of African Americans and 0.09% of Whites; Texas Department of Health, unpublished data). Cocaine use was associated with congenital syphilis in our study, but not in the multivariate model, probably because of the association between cocaine use and prenatal care. Cocaine use has been linked to congenital syphilis through 2 mechanisms. First, cocaine use can be a risk factor for acquisition of maternal syphilis through the trading of sex for drugs.<sup>9,11</sup> Second, pregnant women who use cocaine during pregnancy are less likely to obtain prenatal care than those who do not.<sup>10,12,13</sup> All of the pregnant women in our study already had syphilis; therefore, for this population, we believe that cocaine use led to less use of prenatal care.

Our investigation shows that for pregnant women with syphilis, the timing of syphilis testing is important. The earlier syphilis testing is performed, the longer the time available for effective treatment and for follow-up tests to monitor titer response. Fif-

teen (30%) of the 50 women whose infants had congenital syphilis and who received at least 2 prenatal care visits 30 days before delivery might have been identified and treated had they received syphilis testing early in the third trimester. However, only a small minority of the county's prenatal care providers routinely obtained early third-trimester syphilis tests.

The small sample size may have limited the study's power to identify statistically significant differences between groups. We lacked data about women without syphilis, and we were able to locate and interview only about two thirds of the women who had syphilis during pregnancy. Previous studies, however, have relied solely on medical chart and birth certificate review,<sup>12-16</sup> without systematic examination of local prenatal syphilis screening practices.

The results of our investigation of medical records, prenatal care providers' syphilis screening practices, and in-person interviews with women with syphilis demonstrated that congenital syphilis in Jefferson County is associated with underutilization of prenatal care services, unwanted infants, and missed opportunities during prenatal care, including lack of screening early in the third trimester. Providers of prenatal care in high-prevalence areas such as Jefferson County should be encouraged to screen all pregnant women for syphilis at the first prenatal visit and early in the third trimester. □

### Contributors

K. L. Southwick was principal investigator and was involved in all aspects of the study. H. M. Guidry was instrumental in the design and conception of the study; he also assisted in collecting data and interpreting results and reviewed several drafts of the manuscript. M. Weldon helped with the design and conception of the study, assisted with data collection, and summarized the results of the provider survey. K. J.

Mertz, S. Berman, and W. C. Levine provided valuable insights into the design and conception of the study, analysis of the data, and interpretation of the results and reviewed multiple drafts of the manuscript.

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### References

- Schulz KF, Murphy FK, Patamasuon P, Meheus AZ. Congenital syphilis. In: Holmes KK, Mardh P-A, Sparling PF, Wiesner PJ, eds. *Sexually Transmitted Diseases*. 2nd ed. New York, NY: McGraw-Hill Inc; 1990.
- Plan of Action for the Elimination of Congenital Syphilis*. Presented at: 116th Annual Meeting of the Pan American Health Organization; June 1995; Washington, DC.
- Manual of the International Statistical Classification of Diseases, Injuries, and Causes of Death*. 9th ed. Geneva, Switzerland: World Health Organization; 1977.
- Congenital syphilis case investigation and reporting form instructions. Washington, DC: US Dept of Health and Human Services; September 1991. Form 73.126.
- Kleinbaum DG. *Logistic Regression: A Self-Learning Text*. New York, NY: Springer-Verlag; 1994.
- Centers for Disease Control and Prevention. 1993 Sexually transmitted disease treatment guidelines. *MMWR Morb Mortal Wkly Rep*. 1993;42:RR-14.
- Sexually Transmitted Disease Surveillance, 1994*. Atlanta, Ga: Division of STD Prevention, Centers for Disease Control and Prevention; September 1995.
- Ellerbrock TV, Lieb S, Harrington PE, et al. Heterosexually transmitted human immunodeficiency virus infection among pregnant women in a rural Florida community. *N Engl J Med*. 1992;327:1704-1709.
- Minkoff HL, McCalla S, Delke I, Stevens R, Salwen M, Feldman J. The relationship of cocaine use to syphilis and human immunodeficiency virus infections among inner city par-turient women. *Am J Obstet Gynecol*. 1990; 163:521-526.
- Greenberg MS, Singh T, Htoo M, Schultz S. The association between congenital syphilis and cocaine/crack use in New York City: a case-control study. *Am J Public Health*. 1991;81:1316-1318.
- Farley TA, Hadler JL, Gunn RA. The syphilis epidemic in Connecticut: relationship to drug use and prostitution. *Sex Transm Dis*. 1990; 17:163-168.
- Ricci JM, Fojaco RM, O'Sullivan MJ. Congenital syphilis: the University of Miami/Jackson Memorial Medical Center experience, 1986-1988. *Obstet Gynecol*. 1989;74: 687-693.
- Webber MP, Lambert G, Bateman DA, Hauser WA. Maternal risk factors for congenital syphilis: a case-control study. *Am J Epidemiol*. 1993;137:415-422.
- McFarlin BL, Bottoms SF, Dock BS, Isada NB. Epidemic syphilis: maternal factors associated with congenital infection. *Am J Obstet Gynecol*. 1994;170:535-540.
- Rawstron SA, Jenkins S, Blanchard S, Li P-W, Bromberg K. Maternal and congenital syphilis in Brooklyn, NY: epidemiology, transmission, and diagnosis. *Am J Dis Child*. 1993;147:727-731.
- Desenclos J-CA, Scaggs M, Wroten JE. Characteristics of mothers of live infants with congenital syphilis in Florida, 1987-1989. *Am J Epidemiol*. 1992;136:657-661.