An Evaluation of Risk Factors for Repeat *Chlamydia trachomatis* Infections: Ten Years of Surveillance Data

By

B. Denise Stokich

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Abstract

Background: *Chlamydia trachomatis* infection is the most frequently reported notifiable disease in the United States and in Washoe County, Nevada. This disease is associated with a variety of complications and sequelae, and these risks increase with repeated infections.

Objective: To evaluate existing local data to identify risk factors associated with repeat *Chlamydia trachomatis* infections and make appropriate recommendations for prevention.

Study Design: A retrospective study of patients reported with *Chlamydia trachomatis* infection from 1999 through 2008 included in the local application of the national STD surveillance system.

Results: Among 9,551 unique cases diagnosed with *Chlamydia trachomatis* during the ten year surveillance period, 1,173 (12.3%) had repeat infections. Females were more likely than males to have a repeat infection (odds ratio [OR] 1.8, 95% confidence interval [CI] 1.4, 2.4). Subjects less than 20 years of age and those 20 – 24 years of age were more likely than their older counterparts to have a repeat infection (OR 1.9, 95% CI 1.3, 2.6 and OR 1.5, 95% CI 1.1, 2.1 respectively). Subjects seen in STD Clinic settings (OR 1.6, 95% CI 1.2, 2.2)or by all other providers including drug treatment, other clinic, Job Corps, mental health or Indian Health Services (OR 1.4, 95% CI 1.0, 2.0) were more likely to develop a repeat infection than those seen in other settings. Repeat infection was not associated with race/ethnicity, length of time from diagnosis to treatment, treatment regimen, a history of multiple sexual partners; any acknowledged risk or a history of sex with males.

Conclusions: Repeat infection was relatively common among this population. The results of this study support more frequent screening of sexually active females, all sexually active

persons less than 25 years of age, all persons seen in an STD clinic, and any person with a prior history of a sexually transmitted disease. Missing risk factor data on more than one-third of study subjects suggest the need for a more comprehensive review of available risk factor data, perhaps through the use of the electronic medical record used in the STD clinic. Implementing a patient reminder system to return to the clinic for rescreening using new and innovative methods of communication such as email or text messages may help to identify repeat infections earlier and reduce the burden of disease. Additional prevention opportunities include increased staff for disease investigation, enhanced public education utilizing new forms of communication and social marketing, implementation of partner therapy and streamlined testing protocols, and a shift in focus to primary prevention.

Introduction

Chlamydia is a sexually transmitted disease (STD) caused by the bacterium, *Chlamydia trachomatis* (1) for which humans are the only reservoir. (2) Although poorly defined, the incubation period is thought to be seven to fourteen days or longer. (2) In males the sexually transmitted genital infection presents as urethritis with symptoms including mucopurulent discharge, urethral itching and burning on urination, while in females infection presents in the cervix and results in mucopurulent endocervical discharge. (2) Infection is asymptomatic in up to 25% of males and up to 70% of females. (2)

Chlamydia can result in a variety of complications and sequelae, including pelvic inflammatory disease (PID), a major cause of infertility, ectopic pregnancy and chronic pelvic pain. (2; 3) Complications of infection during pregnancy include premature rupture of membranes resulting in preterm delivery as well as passing the infection to the newborn in the form of ophthalmia and pneumonia. (2) Less common complications include "Bartholinitis, urethral syndrome with dysuria and pyuria, perihepatitis (Fitz-Hugh-Curtis syndrome) and proctitis." (2) Additionally, *Chlamydia* infection is known to facilitate Human Immunodeficiency Virus (HIV) infection transmission, as are other inflammatory STDs. (3)

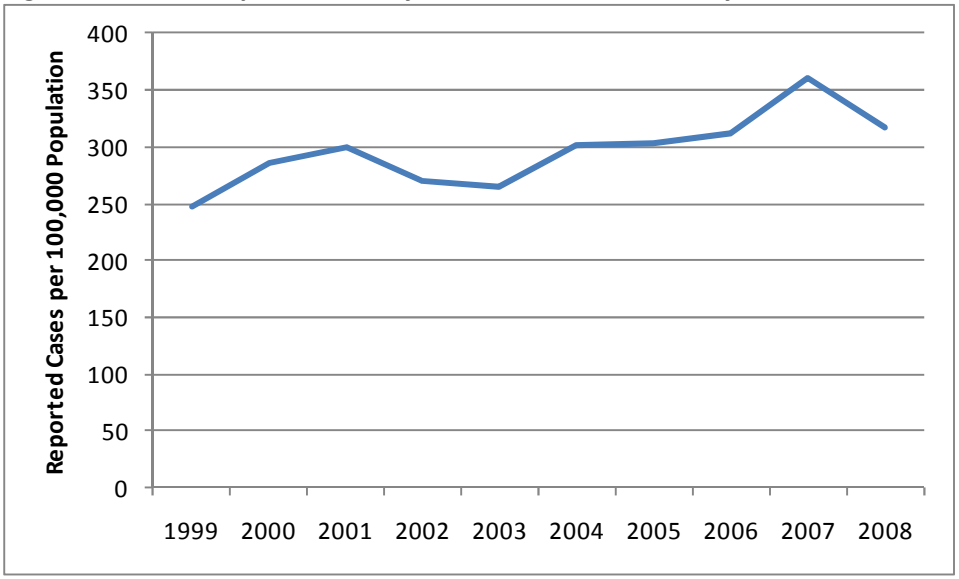
Diagnosis of urethral *Chlamydia* infection in males is performed by testing a urethral swab or urine specimen; in females a urine specimen or swab collected from the endocervix or vagina is tested. (4) Rectal swabs can also be tested for persons who participate in receptive anal intercourse. (4) Multiple tests are available for the detection of *C. trachomatis* including culture, direct immunofluorescence, enzyme immune-assay (EIA), nucleic acid hybridization tests, and nucleic acid amplification tests (NAATs). (4) Increasingly sensitive diagnostic tests are

one of the factors contributing to the increase in reported *Chlamydia* infections in the past 20 years. (3)

Chlamydial infections not only comprise the largest proportion of all STDs reported to the Centers for Disease Control and Prevention (CDC) but are also the most frequently reported notifiable disease in the United States. (3) In 2008 there were over 1.2 million chlamydial infections reported to CDC, corresponding to a rate of 401.3 cases per 100,000 population. This figure represented a 9.2% increase over the rate seen in 2007. The national rate per 100,000 population has increased from 102.5 in 1989 to 402.3 in 2008, an increase of 292%. (3)

Chlamydial infections are also the most frequently reported notifiable disease in Washoe County. In Washoe County, between 796 and 1509 cases of *Chlamydia* have been reported annually between 1999 and 2008. The 2008 rate per 100,000 population was 316, a 27 percent increase from the 1999 rate of 248 (Figure 1). The highest rate occurred in 2007 at 361 reported cases per 100,000 population (Washoe County, unpublished data, 2008).

Figure 1. Rate of reported *Chlamydia* cases, Washoe County, Nevada, 1999-2008.



Washoe County, unpublished data, 2008.

Repeat *Chlamydia* infection is associated with increased risk of sequelae, including ectopic pregnancy and pelvic inflammatory disease (PID), when compared with the initial infection. (4; 5) CDC does not recommend repeat testing for cure three to four weeks after completing therapy due to the effectiveness of recommended regimens and the potential for false positive test results. However, due to the complications associated with repeat *Chlamydia* infection and the fact that most post treatment infections are the result of sex with untreated partners or new partners, CDC does recommend that all women with chlamydial infection be retested 3 months after treatment, or at the next medical visit occurring within 3 – 12 months of the initial infection. (4)

Although various studies currently exist in the literature examining repeat *Chlamydia* infection, many of these studies focus on a particular clinical setting, such as STD clinics (6; 7; 8; 9; 10; 11), or a particular segment of the population such as adolescents (12), females (13; 14; 15), or persons serving in the military (16). Few studies exist that examine comprehensive population-based data from STD registries (17; 18). An extensive analysis of local level data in Washoe County has not previously been performed. However, a preliminary analysis conducted in 2005 did recommend that additional studies should be undertaken (Washoe County, unpublished data, 2005). The purpose of this study was to evaluate existing local data to identify risk factors for repeat *Chlamydia trachomatis* infection and make appropriate recommendations for prevention.

Methods

Data Source

Chlamydia trachomatis infection of the genital tract has been a reportable condition in the state of Nevada since 1992. (19) Laboratories, health care providers, and medical facilities are required to report laboratory-confirmed chlamydial infections to the local health authority within one business day. (19) Washoe County Health District is the local health authority for the county of Washoe, which consists of the cities of Reno and Sparks in northern Nevada. The estimated population of Washoe County in 2008 was 423,833. (20) Cases reported are referred to one of two Disease Intervention Specialists (DISs) for investigation to confirm the diagnosis, identify contacts, and ensure that the case and any identified contacts have received appropriate testing and treatment. (19) All cases are entered by the DISs into a database called STD*MIS. STD*MIS is a voluntary application provided to state and local health departments by CDC to facilitate the management of data received from laboratories, health care providers, clinics, etc. It also allows for the transmission of "non-named case morbidity data" to be transmitted to CDC. (21) Data for this study was obtained from the local application of STD*MIS.

Definitions

A repeat infection was defined as a *Chlamydia trachomatis* infection detected greater than thirty days after appropriate treatment of a previous infection. Treatment was considered appropriate if it was consistent with the current CDC recommendations that were available at the time of diagnosis. (4; 22; 23) The thirty-day interval was measured from the date on which the initial infection was treated to the date of testing for the subsequent or "repeat" infection.

The thirty-day minimum interval was used due to the possibility of false-positive results with some diagnostic tests (including nucleic acid amplification tests or NAATs) when performed less than three weeks after successful treatment. (4) For persons with multiple repeat infections, only the first repeat infection was included in the final data set, all subsequent repeat infections as well as the initial infection for these subjects were excluded from the final data set employed for further analysis.

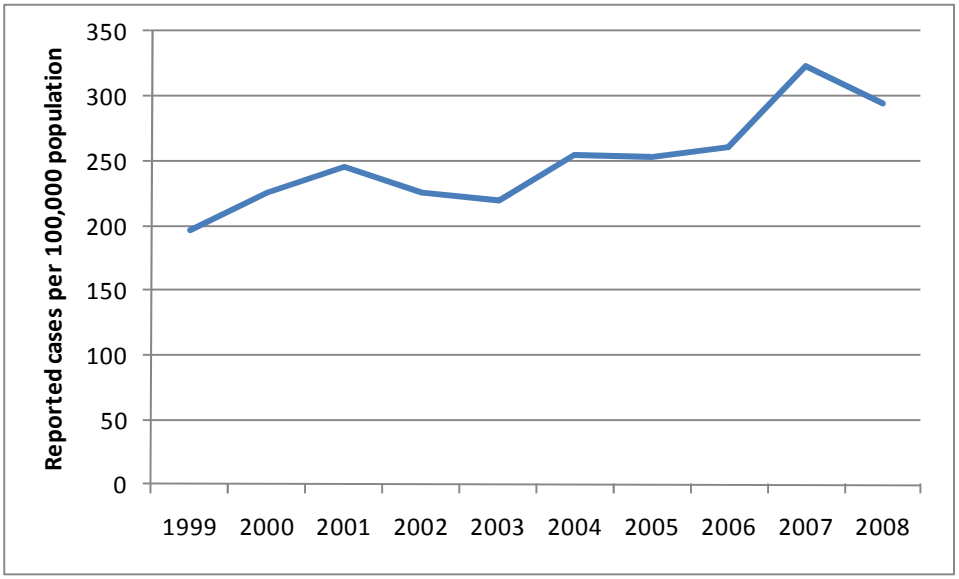
Statistical Methods

Data was exported from STD*MIS into four separate Excel files: laboratory module, morbidity module, treatment module and risk module. The Excel files were then de-identified. The laboratory, morbidity and treatment modules were imported into PASW Statistics 17.0 (SPSS Inc., Chicago, IL) and linked by patient ID and event ID. This main database was reviewed to identify infections as repeat or non-repeat infections. The risk module was imported into PASW Statistics 17.0 and restructured so that there was only one row per event, with the risk factors listed in columns. Finally, the risk data was linked with the main data in PASW Statistics 17.0 to create the final database for analysis. All statistical analyses were completed using PASW Statistics 17.0. Bivariate analysis was performed to assess the association between outcome variable and the different indicator variables. Chi-square was used except when a cell's expected value was smaller than five in which case Fisher's exact test was used. All variables with a *p* value of 0.10 or less were included in the binary logistic regression for the final association magnitude assessment and reporting.

Results

Between 1999 and 2008, a total of 11,743 episodes of urogenital chlamydial infection were reported to the Washoe County Health District. Of these 11,743 episodes, 9,551 unique cases remained in the final cohort for analysis after excluding 1,173 initial infections for persons with more than one infection, 532 subsequent infections for persons with more than one repeat infection, and 487 infections that were either too close to a previous infection to be counted as a repeat case (i.e. thirty days or less), or were one of more than one episode for a case but were either not treated, or were not treated with one of the CDC recommended treatment regimens. The annual rate of reported *Chlamydia* cases ranged from 196 to 324 cases per 100,000 population (Figure 2). The rates in Figure 2 will be slightly lower than those shown in Figure 1 because Figure 2 represents unduplicated subjects. The rate in 1999 was the lowest at 196 cases per 100,000 population. In 2008 the rate decreased from its peak in 2007 of 324 to 294 cases per 100,000 population.

Figure 2. Rate of reported unduplicated *Chlamydia* cases, Washoe County, Nevada, 1999-2008.



Note: Data will differ slightly from locally reported data due to deduplication in the data set used for final analysis.

Table 1. Characteristics of subjects, adjusted odds ratio (OR) and 95% confidence interval (CI) for indicators of repeat *Chlamydia* infection (N = 9,551), Washoe County, Nevada, 1999-2008.

	All cases		Cases with ≥1 repeat infection		OR[§]	95% CI[§]
	N	%	*n*	*n/N* (%)		
Total	9551		1173	12.3		
Gender						
Female	5954	62.3	807	13.6	1.84	1.40, 2.43**
Male	3579	37.5	332	9.3	Reference	
Race/Ethnicity						
American Indian/Alaskan Native	294	3.1	43	14.6	1.29	0.80, 2.08
Asian/Pacific Islander	530	5.5	62	11.7	0.87	0.59, 1.29
Black	1234	12.9	184	14.9	0.89	0.69, 1.16
Hispanic	2899	30.4	339	11.7	1.02	0.84, 1.25
Other/Unknown	110	1.2	27	24.5	0.65	0.23, 1.88
White	4484	46.9	502	11.2	Reference	
Age Group (in years)						
< 20	3485	36.5	446	12.8	1.86	1.33, 2.59**
20 - 24	3522	36.9	436	12.4	1.48	1.07, 2.06*
25 - 29	1449	15.2	158	10.9	1.12	0.77, 1.63
> 29	1053	11.0	94	8.9	Reference	
Provider Type						
Family Planning	1145	12.0	152	13.3	1.39	0.99, 1.94
Hospital/Emergency Department	523	5.5	46	8.8	1.17	0.74, 1.84
Jail/Corrections	523	5.5	80	15.3	1.45	0.92, 2.27
Reproductive Health	1153	12.1	132	11.4	1.14	0.81, 1.62
STD[§] Clinic	2945	30.8	388	13.2	1.62	1.19, 2.21**
All Other Providers[§]	1257	13.2	174	13.8	1.43	1.02, 2.00*
Private Physician/HMO[§]	1963	20.6	162	8.3	Reference	
Test Type						
CT NAAT[§]	4519	47.3	616	13.6	1.49	1.18, 1.89**
CT Other[§]	394	4.1	35	8.9	1.51	0.85, 2.67
CT DNA Probe[§]	4596	48.1	483	10.5	Reference	
Diagnosis to Initiation of Treatment						
4 - 7 Days	1410	14.8	204	14.5	1.23	0.97, 1.56
> 7 Days	886	9.3	125	14.1	1.27	0.95, 1.71
< 3 Days	7237	75.8	810	11.2	Reference	
Treatment						
Doxycyline	857	9.0	93	10.9	1.35	0.98, 1.85
Other	73	0.8	7	9.6	1.95	0.81, 4.66
Azithromycin	8344	87.4	1020	12.2	Reference	
Multiple Partners						
Yes	1071	11.2	166	15.5	0.96	0.68, 1.35
No	4851	50.8	609	12.6	Reference	
History of STD Diagnosis						
Yes	921	9.6	716	77.7	305.09	223.40, 416.66**
No	5001	52.4	59	1.2	Reference	
Any Risk						
Yes	5414	56.7	766	14.1	1.45	0.61, 3.44
No	508	5.3	9	1.8	Reference	
Sex with Male						
Yes	3604	37.7	543	15.1	0.89	0.61, 1.28
No	2318	24.3	232	10.0	Reference	

* $p < 0.05$; ** $p < 0.01$

[§] OR, odds ratio; CI, confidence interval; STD, sexually transmitted disease; All Other Providers: Drug Treatment, Other Clinic, Job Corps, Mental Health, Indian Health Services, Other; HMO, health maintenance organization; CT NAAT, Chlamydia trachomatis nucleic acid amplification test; CT Other, Chlamydia trachomatis Other includes culture & PCR; CT DNA Probe, Chlamydia trachomatis DNA probe.

Characteristics for all subjects in the final data set are included in Table 1. All characteristics were measured at the time of the included infection. The median age of all cases was 21 years with 37 percent of cases less than 20 and 37 percent between 20 and 24 years of age. The median age of repeat cases was also 21 years. Sixty-two percent of all cases were female; 47 percent were white, non-Hispanic. Almost half (48.3%) of all cases were seen in publicly funded clinics, including STD clinics, family planning clinics, HIV testing sites, and jail/correctional settings. Ninety-five percent of cases were tested with either CT DNA probe or CT NAAT. The majority of cases (87%) were treated with azithromycin and most cases (76%) were treated within three days of diagnosis.

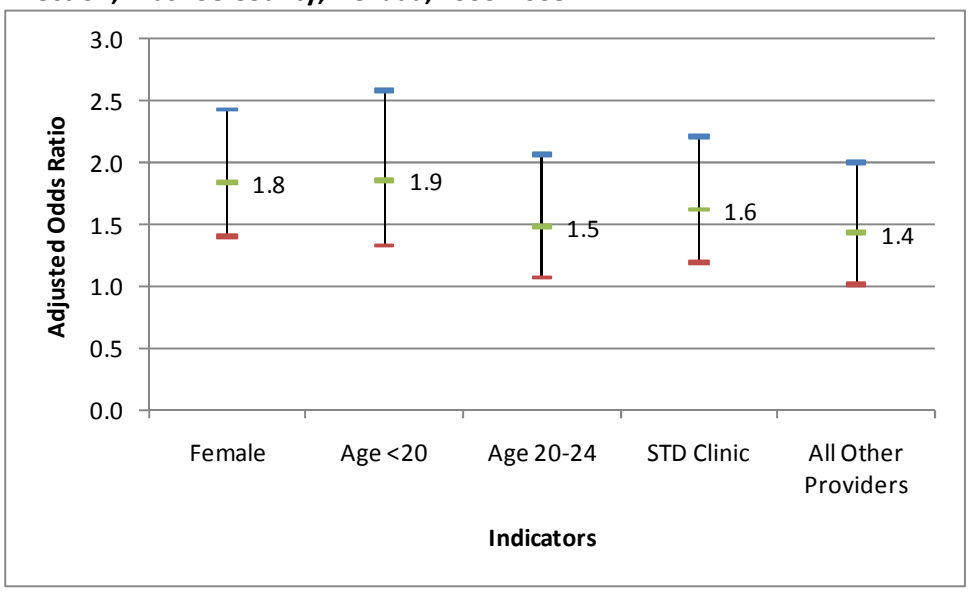
In the final data set 12.3 percent of cases (1173 of 9551) were repeat infections. Of demographic characteristics, only gender and age were statistically significant associated with repeat infection after adjusting for the confounding effects from other variables, including race/ethnicity, provider type, test type, length of time from diagnosis to treatment, multiple partners, history of STD diagnosis, any acknowledged risk and sex with males. Females were more likely than males to have a repeat infection (odds ratio [OR] 1.8, 95% confidence interval [CI] 1.4, 2.4). Subjects less than 20 years of age and those 20 – 24 years of age were more likely than their older counterparts to have a repeat infection (OR 1.9, 95% CI 1.3, 2.6 and OR 1.5, 95% CI 1.1, 2.1 respectively). Other/unknown race ethnicity saw the highest rate of repeat infection at 24.5 percent, followed by Blacks at 14.9 percent and American Indian/Alaskan Native at 14.6 percent. The remaining groups were similar with Asian/Pacific Islander and Hispanics at 11.7 percent and whites at 11.2 percent; however, race/ethnicity was not a statistically significant indicator.

Provider type was statistically significant associated with repeat infection after adjusting for the confounding effects from other variables including age group, gender, race/ethnicity, test type, length of time from diagnosis to treatment, multiple partners, history of STD diagnosis, any acknowledged risk and sex with males. Subjects seen at an STD Clinic (OR 1.6, 95% CI 1.2, 2.2) or at All Other Providers including drug treatment, other clinic, Job Corps, mental health or Indian Health Services (OR 1.4, 95% CI 1.0, 2.0) were more likely to develop a repeat infection than those seen in other settings. Although subjects seen in jail/corrections had the highest rate of repeat infection at 15.3 percent, this was not statistically significant.

Test type was statistically significant associated with repeat infection after adjusting for the confounding effects from other variables including age group, gender, race/ethnicity, provider type, length of time from diagnosis to treatment, multiple partners, history of STD diagnosis, any acknowledged risk and sex with males. Subjects tested by nucleic acid amplification were more likely to have a repeat infection (OR 1.5, 95% CI 1.2, 1.9) than those tested by other methods.

An obvious statistically significant indicator was that of a prior history of STD diagnosis. After adjusting for the confounding effects from other variables including age group, gender, race/ethnicity, test type, provider type, length of time from diagnosis to treatment, multiple partners, any acknowledged risk and sex with males, subjects with a history of STD diagnosis were more likely than those without to develop a repeat infection (OR 305.1, 95% CI 223.4, 416.7). Sexual behavior, specifically history of multiple partners, any acknowledged risk or sex with male, was not associated with repeat infection in multivariate analysis. All statistically significant indicators with the exception of history of STD diagnosis are plotted in Figure 3.

Figure 3. Adjusted odds ratio (OR) and 95% confidence interval (CI) for indicators of repeat *Chlamydia* infection, Washoe County, Nevada, 1999-2008.



The yearly rate of repeat infection for all cases ranged from 3.6 to 14.1 percent (Figure 4). Males ranged from 2.6 to 11.4 percent while females ranged from 4.0 to 16.2 percent. Almost one-third (30.5%) of cases with repeat infection were diagnosed within six months of the initial infection (Table 2). The median length of time between initial and repeat infection was 11.5 months (range 1 month to 9 years). The total number of reported infections per subject as shown in Table 3 ranged from two (942 subjects) to seven (one subject).

Figure 4. Percent of repeat *Chlamydia* infections by year and gender, Washoe County, Nevada, 1999-2008.

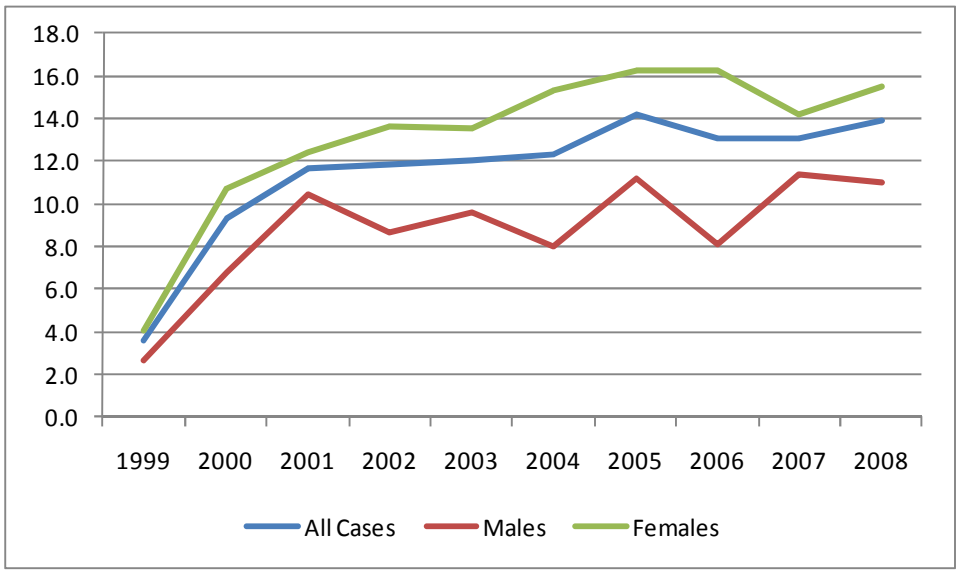


Table 2. Time from initial *Chlamydia* infection to first repeat infection, Washoe County, Nevada, 1999-2008.

Time between initial & 1st repeat infection	# of Repeat Infections	% of Repeat Infections	% of all Cases
< 6 months	358	30.5	3.7
6 - 18 months	392	33.4	4.1
> 18 months	423	36.1	4.4
Total	1173	100.0	12.3

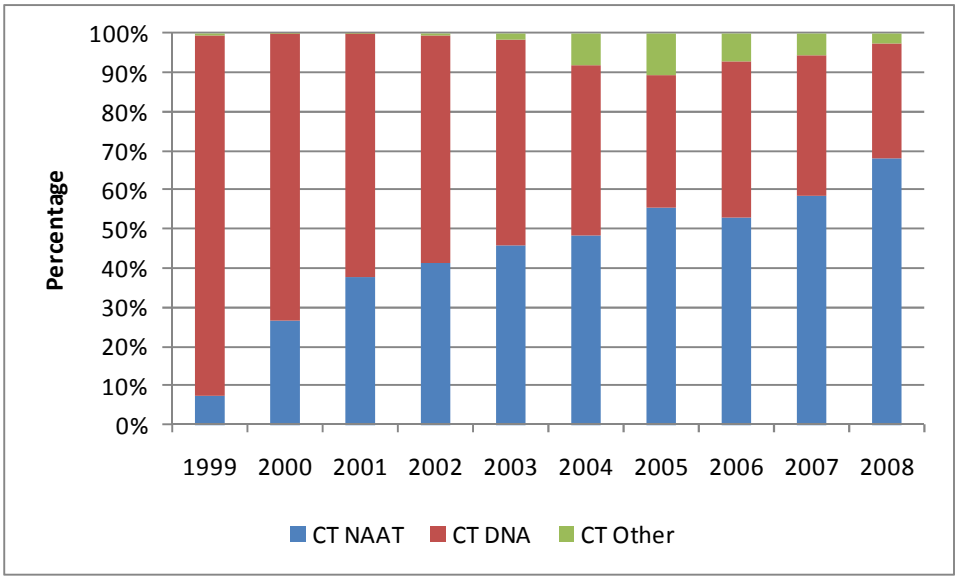
Table 3. Total number of repeat *Chlamydia* infections, Washoe County, Nevada, 1999-2008.

Total # of Infections	# of Repeat Infections	% of Repeat Infections	% of all Cases
2	942	80.3	9.9
3	182	15.5	1.9
4	34	2.9	0.4
5	10	0.9	0.1
6	4	0.3	0.0
7	1	0.1	0.0
Total	1173	100.0	12.3

Also of note is the shift from DNA probe testing to nucleic acid amplification testing for *Chlamydia trachomatis* (Figure 5). In 1999, only 11 percent of cases were identified through nucleic acid amplification testing while 89 percent of cases were identified through DNA probe

testing. By 2008, nucleic acid amplification testing had increased to 68 percent, while DNA probe testing had decreased to 29 percent.

Figure 5. Test type for *Chlamydia* cases represented as percent of total cases, Washoe County, Nevada, 1999-2008.



CT NAAT: *Chlamydia trachomatis* nucleic acid amplification test
CT DNA: *Chlamydia trachomatis* DNA probe
CT Other: *Chlamydia trachomatis* culture and *Chlamydia trachomatis* PCR

Discussion

This study demonstrated a substantial increase in rate of *Chlamydia trachomatis* infections during the ten year surveillance period. The 1999 rate of 196 cases per 100,000 population increased to 294 cases per 100,000 population in 2008, an increase of 50 percent. This increase is similar to that seen at the national level. (3) As with the national level data, there are a number of possible explanations for this increase, including expansion of *Chlamydia* screening activities, use of more sensitive tests and more complete reporting. (3) Annual screening of all sexually active women under 26 years of age and women over 25 with risk factors as is currently recommended by CDC (4) contributes to increased screening for this infection in females. Although similar CDC guidelines for screening of sexually active males do

not currently exist (4), the increased availability of urine testing for this infection has resulted in increasing numbers of men being tested for *Chlamydia* as well. (3) The new generation of molecular diagnostic STD tests provides superior performance without being invasive (12), and has improved sensitivity. Both the increased emphasis on provider and laboratory reporting and the advancements in the information systems used for reporting have also contributed to the increase in rate. Finally, the increase in incidence of *Chlamydia trachomatis* in Washoe County may reflect a true increase in morbidity for this infection, as is suspected with national level data. (3)

The overall repeat *Chlamydia trachomatis* infection rate for this study was 12.3 percent; slightly higher for females at 13.6 percent and lower for males at 9.3 percent. This overall rate of 12.3 percent is comparatively lower than that seen in several previous studies which ranged from 13.4 to 16.4 percent. (12; 13; 18) This is understandable given the passive nature of this study, as subjects were not required to return at specific intervals for repeat testing as with some prospective studies. However, this rate is also higher than that seen in multiple other previous studies which ranged from 7.5 to 11.9 percent. (9; 11; 16; 24; 25) Since this study used ten years of surveillance data it afforded a longer follow up period than that of most studies, providing more time for subjects to be reinfected. In addition, limitations were not placed on the time from initial to repeat infection as in some previous studies.

The magnitude of association between age group and repeat infection is smaller in this study than that found in a similar study conducted by Xu et al. using Washington state surveillance data from 1993 to 1998. (17) Xu et al. found that females aged 10-14 years were 6.3 times more likely to develop at least one repeat infection and females 15-19 years were 3.5

times more likely to develop a repeat infection compared to females 30-44 years of age. Although the present study found subjects less than 20 years of age more likely to develop repeat infection when compared with subjects 30 years of age and older, the magnitude of that association was only 1.9. This difference in strength of association is likely due to differences in study design. While the present study analyzed characteristics at the time of the included infection, in the Washington study all characteristics with the exception of clinic type were measured at the time of the initial infection. (17) It may also be that this variation in magnitude is the result of differences in the populations under surveillance.

A surprising finding was that behavioral risk factors such as history of multiple partners, any acknowledged risk and sex with males were not associated with development of repeat *Chlamydia trachomatis* infection. However, this finding is most likely related to the fact that risk factor data was missing for 38 percent of cases in the cohort (3629/9551).

The key strengths of this study are related to the source of data. Using readily available surveillance data allowed for a long study period of ten years as well as provided population-based data. As stated by Xu et al., studies that are limited to specific clinic-based settings may underestimate the frequency of repeat infection, since women change their source of care regularly. (17) This study included all clinical settings where *Chlamydia trachomatis* was diagnosed, including both the public and private sector.

This study has several limitations. Since the data source consisted of previously collected surveillance data, it was passive in nature and there was no active follow up effort. Subjects were not recruited and followed up at predetermined intervals for rescreening. Instead, it was dependent on the subject to seek care and the health care provider to perform

appropriate testing. As with the Washington state study, the number of repeat *Chlamydia* infections may have been underestimated since repeat infections in subjects who moved out of Washoe County would have been missed. Because the study was based on surveillance data, the reason for clinic visit was not available. In addition, risk factor data was missing on more than one-third of cases. Finally, it may have been helpful to use smaller age groups for analysis, for example 10-14, 15-19, 20-24, 25-29, and 30-44, as well as to have analyzed males and females separately.

Recommendations

The results of this study support more frequent screening of sexually active females, all sexually active persons less than 25 years of age, all persons seen in an STD clinic, and any persons with a prior history of a sexually transmitted disease. However, since risk factor data was missing for more than one-third of cases in this study, additional studies of local level data should be taken. Since those cases that were missing risk factor data in this study were likely those cases that were not interviewed by STD prevention and control staff, an analysis of STD clinic data from the electronic medical record used for documenting clinic visits at Washoe County Health District would provide a much more in-depth evaluation of potential risk factors. This additional analysis may help to refine the present recommendations further. Building canned reports into the clinic database to enable the routine analysis of risk factors would provide real-time data to target prevention and control measures.

A call-back system in which cases are reminded at three months and then again at six months post-infection (if no response to the first reminder) to return to the clinic for repeat screening would be beneficial, since currently there is no such system in place and it is

dependent on the patient to return on their own for follow-up. Email addresses and cell phone numbers could be collected as part of the clinic visit and entered into the database. Clients could be asked how they would prefer to receive reminder messages to return for follow-up appointments, with the understanding that the messages would be generic and not contain any confidential information. Confidentiality issues would require that the patient's name not be included in the message, that emails be sent from a generic address, and that the email itself not contain any protected health information. A statement such as "Please contact us at 775-328-2170 to schedule your next appointment" would be generic enough to not breach confidentiality but specific enough to convey the message. Exploration of acceptable and effective methods for reminders should be explored with age-appropriate focus groups. Implementing a patient reminder system to return to the clinic for rescreening using new and innovative methods of communication may help to identify and treat repeat infections earlier, thereby decreasing the length of time individuals are infected and transmitting the disease to partners and ultimately reduce the burden of disease.

The analysis and interpretation of local level data is just one tool in an effort to better understand the transmission of Chlamydial infections. Many other opportunities exist to improve the prevention and control of this disease. For example, only two Disease Intervention Specialists are responsible for investigating more than 1200 annual *Chlamydia* cases. This is in addition to the gonorrhea and syphilis cases they are also responsible for, as well as providing coverage in the STD clinic. Increased staff may help to identify and treat more cases and their contacts, thereby reducing disease burden. Implementation of partner therapy and streamlined testing protocols to shorten clinic visits and reduce invasiveness of exams could be

explored to determine potential benefits. Increased funding for public education campaigns to emphasize how common this disease is, the potential sequelae that result from infection such as PID, and to reinforce the asymptomatic nature and importance of screening may also be beneficial in reducing disease burden. The rapid advancement of technology provides numerous new methods of communication which could be used to provide public health education regarding STDs. Various social networking methods exist as well as traditional media forms such as television or radio through which social marketing campaigns could be launched. Although current budget restraints make the possibility of increased funding for staff and public education efforts unlikely, funding through acquisition of grants could be explored. Unfortunately, as with many diseases, to a great extent public health and health care efforts focus on treatment of the disease once it is diagnosed. The focus needs to be shifted to primary prevention methods so that as much if not more effort is put into preventing the disease from occurring in the first place.

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