

Epidemiology oral session 1: Chlamydia

01-S01.01 CHLAMYDIA TRENDS IN THE USA: RESULTS FROM MULTIPLE DATA SOURCES

doi:10.1136/sextrans-2011-050109.1

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Background Chlamydia is the most commonly reported notifiable disease in the US, with over 1.2 million cases reported in 2009 (409.2 per 100 000 population). While rates based on case reports have been climbing steadily over the past 20 years (155% increase), interpretation of trends is difficult due to better disease detection, reporting, and screening coverage among sexually active women aged 15–24 years. Prevalence data from other sources may be more reflective of national morbidity trends.

Methods Chlamydia trends were analysed using data from three alternative sources. Using data from the National Health and Nutrition Examination Survey (NHANES), chlamydia prevalence from 1999 to 2006 was assessed in a nationally representative sample of the US population aged 14–39. Using data from the Infertility Prevention Project (IPP), two analyses of chlamydia positivity trends in different populations were conducted. The first analysis modelled trends among women aged 15–24 years tested in family planning clinics from 2004 to 2008; the second evaluated women aged 15–24 years who were tested in prenatal clinics from 2004 to 2009. Finally, data collected through the National Job Training Program (NJTP) on trends from 2003 to 2007 among high-risk men and women aged 16–24 years, were modelled. Models (IPP and NJTP analyses) controlled for age, race, geography, and test technology.

Results Based on analyses of data from each of these populations, chlamydia prevalence trends were flat or decreasing. In NHANES, prevalence declined 48% (95% CI: 23% to 72%), from 2.6% (95% CI: 1.9% to 3.5%) in 1999–2000 to 1.4% (95% CI: 0.9% to 2.0%) in 2005–2006. In IPP prenatal clinics, chlamydia positivity also decreased; the adjusted odds of having a positive chlamydia test declined by 35% from 2004 to 2009. Likewise, in the NJTP, the odds of a positive test decreased by 19% in women and 8% in men from 2003 to 2007. In IPP family planning clinics, positivity neither increased nor decreased from 2004 to 2008.

Conclusions Although rates of chlamydia based on case reports are increasing, analyses of prevalence data suggest that the overall prevalence of chlamydia may be decreasing. Reported chlamydia case rates are likely reflections of policy and programmatic changes and do not accurately reflect morbidity trends.

01-S01.02 THE INCIDENCE OF GENITAL CHLAMYDIA TRACHOMATIS IN A COHORT OF YOUNG AUSTRALIAN WOMEN

doi:10.1136/sextrans-2011-050109.2

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Background Chlamydia is a sexually transmitted infection that can cause serious upper genital tract infections, however, in Australia there are limited population data for chlamydia. Understanding the incidence of chlamydia will be important in the design of a chlamydia screening program in Australia.

Method Women aged 16–25 years were recruited from sexual health clinics (SHC) and general practice clinics (GP) in South-Eastern Australia and consented to participate in longitudinal study over a 12-month period. Participants were requested to send back questionnaires and self-collected vaginal swabs through the post which were tested for chlamydia.

Results Overall, 1116 women were recruited from 29 clinics; with a 79% retention rate. *C trachomatis* prevalence at baseline was 4.9% (95% CI: 2.9% to 7.0%) and incidence rate for the 12-month study period was 4.4 per 100 women-years (95% CI: 3.3% to 5.9%). Prevalent *C trachomatis* was associated with having had *C trachomatis* previously [AOR: 2.0 (95% CI: 1.1% to 3.9%)], increased numbers of sexual partners [AOR: 6.4 (95% CI: 3.6% to 11.3%)] and unprotected sex [AOR: 3.1 (95% CI: 1.0% to 9.5%)]. Antibiotic use and older age were protective against having a prevalent infection ([AOR: 0.4 (95% CI: 0.2% to 1.0%)] and [AOR: 0.9 (95% CI: 0.8% to 1.0%)] respectively) and an incident infection ([AOR: 0.1 (95% CI: 0.0% to 0.6%)] and [AOR: 0.4 (95% CI: 0.2% to 0.8%)] respectively). Incident *C trachomatis* was also associated with more partners [AOR: 4.0 (95% CI: 1.9% to 8.6%)]. More than 20% of women with *C trachomatis* had a re-infection during the study [20.3% (95% CI: 11.6% to 31.7%)] with an infection rate of 20.0 (95% CI: 11.9% to 33.8%) per 100 women years. The median chlamydia organism load was 1.4 × 10⁵/5µl and the most common serovar identified was serovar E (51.9%).

Conclusion Chlamydia is a common STI in young Australian women, and an incidence of 4.9 per 100 women years for chlamydia suggests annual testing is appropriate for a chlamydia screening program. The high re-infection rate indicates the importance of partner notification and re-testing 3 months after treatment.

01-S01.03 HIGH YIELD IN REINFECTIONS DURING A CHLAMYDIA SCREENING PROGRAMME WHEN AUTOMATICALLY SENDING TESTKITS AFTER 6 MONTHS TO PREVIOUSLY INFECTED

doi:10.1136/sextrans-2011-050109.3

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Background Reinfections remain challenging in the control of *Chlamydia trachomatis* (Ct). In a systematic internet-based Ct Screening programme (CSI) in the Netherlands, all Ct-positive participants automatically received a test kit after 6 months to facilitate discovery of reinfections. Determinants for reinfection for two screening rounds, treatment and partner notification are discussed.

Methods CSI-home-based testkits can be requested online after register based postal invitation. Infected participants get a referral letter for their health provider to get treatment for themselves and their current partner; ex-partners can be alerted by the participant and request a test kit via the website. Participants fill in a questionnaire on sexual behaviour voluntarily. Ct-positives answer questions about treatment and partner notification 10 days after checking their results. Infected participants who do not check their result online receive it by postal letter. After 6 months retest kits are automatically sent to previously infected participants.

Results Overall, 3185 participants (4.1%) tested positive; 7% of Ct-positives did not check their result online and received a postal letter. The majority (86%) of Ct-positive participants who answered the treatment questionnaire (response 43%) was treated within 2 weeks after checking their result online; 80% of those with a current relationship reported their partner had also been treated and 16% of those with past relationships notified ex-partners via the website. One third of the ex-partners participated, 28% of whom were Ct-positive. After 6 months, 3055 participants received a retest kit and 66% responded. The reinfection rate was 8.8%. Results of the questionnaire revealed 75% of retest-positives had been treated for the initial infection and 70% had had their partner treated, while these proportions were 87% and 80% among retest-negatives. At

higher risk for reinfections were young people (<20 years 17%), specific ethnic minorities (Netherlands Antillean 16%, Turkish 17%, sub-Saharan African 18%), persons living in Rotterdam (11 vs 8% Amsterdam 4% Limburg), and in high-risk areas (14%).

Conclusions The uptake of retesting was successful counting two third with automatically sent testkits 6 months after screening. Reinfection rates were high, especially among known risk-groups. Questionnaire results show that follow-up of (partner) treatment after Chlamydia infections could be improved.

01-S01.04 SUBOPTIMAL REPEAT TESTING OF WOMEN WITH POSITIVE CHLAMYDIA TESTS IN THE USA, 2008–2010

doi:10.1136/sextrans-2011-050109.4

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Background Women treated for chlamydia have a high prevalence of infection several months later, likely caused by reinfection from an untreated or new infected sex partner. To prevent potential adverse outcomes of chlamydia, US guidelines recommend repeat testing 3 months after treatment, regardless of partner treatment. If retesting at 3 months is not possible, women should be retested at their next clinical encounter within 12 months. A chlamydia test-of-cure is also recommended for all infected pregnant women 3–4 weeks after treatment. We assessed adherence to retesting guidelines using data from a US laboratory corporation that has a large share of the US market.

Methods Among tests performed from June 2008 to May 2010, we estimated the percentage of women who were retested ≥ 3 weeks later by test result, age and pregnancy status. We also estimated the positivity rate among repeat chlamydia tests and the mean time between an initial test and the first repeat test. We assumed that for each woman in the database all chlamydia tests during the study period were performed by this laboratory corporation.

Results Among 2.90 million chlamydia tests performed in 1.77 million women, 4.0% (114 963) were positive. Among the 1.77 million women with tests, 1.34 million (75.7%) had only a single test and 0.43 million (24.3%) had at least one repeat test. If an initial test was positive, 48.6% were retested compared to 23.5% if the initial test was negative ($p < 0.01$); a repeat test was more likely to be positive in women with an initial positive test (13.3%) than a negative one (3.3%) ($p < 0.01$). The mean time interval between the initial and repeat test was shorter if the initial test was positive (117 days) than negative (149 days). Women aged 15–24 years with a positive test had a lower retesting rate than those aged 25–34 years (46.8% vs 53.3%). The percentage of women with a positive test who were retested differed significantly by pregnancy status (60.0% pregnant vs 44.2% nonpregnant), and pregnant women had a repeat test within 93 days compared to 125 days in nonpregnant women.

Conclusions These data from a large laboratory corporation provide insight into chlamydia testing practices among women in the USA, and suggest suboptimal adherence to retesting recommendations for both pregnant and nonpregnant women. These data can be useful to monitor the effectiveness of interventions to improve follow-up testing of women with chlamydia.

01-S01.05 ESTIMATING THE RATE OF ANNUAL CHLAMYDIA SCREENING UPTAKE IN US WOMEN

doi:10.1136/sextrans-2011-050109.5

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Background Annual chlamydia testing of all sexually active women aged 25 years and under followed by a repeated test 3 months after

treatment is recommended by the US Centers for Disease Control and Prevention (CDC) guidelines. Data from the Healthcare Effectiveness Data and Information Set (HEDIS) estimate chlamydia test coverage at about 40% per year in the last 5 years. We used empirical data and mathematical models to determine whether observed patterns of chlamydia testing are consistent with CDC guidelines and with actual trends in chlamydia prevalence in US women aged 15–25 years.

Methods First, published data from women enrolled in commercial health plans from 2002 to 2006 ($n = 1\,985\,920$) were used to estimate the annual chlamydia testing rate in women aged 15–25. Second, trends in chlamydia prevalence in the same age group were studied using data from 1999/2000 to 2007/2008 ($n \sim 600$ each round) from the US National Health and Nutrition Examination Survey (NHANES). We used a Susceptible-Infected-Recovered-Susceptible (SIRS) model to estimate the annual screening rate that fit the chlamydia prevalence data best. The model described a closed population with behavioural parameters reflecting people aged 15–25 years. It explicitly incorporated sexual partnerships and took into account re-infection. Finally, the model was used to examine the effect of repeated chlamydia testing 3 months after treatment on chlamydia prevalence and to calculate repeat infection rates.

Results The estimated rate at which women are tested for chlamydia ranges from 0.06 to 0.11 per year, which corresponds to a chlamydia test every 9 to 16 years on average and an annual coverage of roughly 10%. We found no statistical evidence that chlamydia prevalence changed between 1999 and 2008 in sexually active women aged 15–25 years taking part in NHANES. Predictions from the model of the impact of screening at a rate of 0.11 per year were consistent with the observed stable chlamydia prevalence. Repeat chlamydia testing 3 months after treatment at the estimated screening level hardly influenced population prevalence. The percentage of women with a repeat infection was highest 3.8 months after treatment.

Conclusion Our study demonstrates the challenges of implementing chlamydia screening. This study suggests that low rates of chlamydia testing in the US have not reduced population chlamydia prevalence substantially.

01-S01.06 ESTIMATION OF THE BURDEN OF DISEASE AND COSTS OF GENITAL CHLAMYDIA TRACHOMATIS INFECTION IN CANADA

doi:10.1136/sextrans-2011-050109.6

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Background *Chlamydia trachomatis* (CT) is the most common notifiable infectious disease in Canada. Rates of infection have been increasing since the mid-1990s, suggesting that alternate control strategies may be required. Given that the current cost of Chlamydia infections in Canada is unknown, we sought to estimate the burden of CT in the Canadian population, to provide a foundation on which health economic analyses of competing Chlamydia control strategies can be constructed.

Methods We used an age- and sex-structured mathematical model parameterised to reproduce trends in CT prevalence in the Canadian population aged 10 to 39 years. Model parameters were derived from epidemiologic studies and by model calibration. We incorporated data on changing test patterns of asymptotically infected individuals over time. Costs were identified, measured, and valued using a modified societal perspective and were converted to 2009 Canadian dollars. The main outcome measures were the current net cost and burden of illness attributable to CT infection.

Results The model reproduced trends in CT prevalence observed for the time period between 1991 and 2008. Under base case model assumptions, there appeared to be a trend of increasing detection of