Efficacy of partner notification for *Chlamydia trachomatis* among young adults in youth health centres in Uppsala County, Sweden

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Abstract

**Background** The study was conducted to define the contact-tracing success rate of the partner notification services routinely provided by the community-based youth health centres and the county medical officer for communicable disease control (CMO) in Uppsala County, Sweden.

**Objective** The study had three goals, (i) to register the number of sexual partners routinely reported by each diagnosed index case with CT and the success rate in tracing and testing these partners for CT infection. (ii) To analyse the current notification practices in reporting the number of cases of unsuccessful contact tracing to the CMO. (iii) To determine the contact tracing success rate of the partner notification services provided by the CMO.

**Methods** Each diagnosed case of CT is obliged by law to participate in the contact-tracing procedure performed by the physician managing the patient or by a specialised sexually transmitted infection (STI) adviser. Successful contact-tracing is defined as the confirmed attendance of a sexual contact within 12 months of the contact with the index case.

**Results** The number of CT cases diagnosed by the youth health centres during the study period was 463 (299 females and 164 males). The females reported 660 male sexual contacts and the males reported 386 female contacts. Successful partner notification was achieved for 73% of all sexual contacts. 284 (190 females and 94 males) unsuccessful partner notifications were reported to the CMO of whom 98 (52%) of the female contacts and 20 (21%) of the male contacts were successfully notified by the CMO. However, for 134 (71 females and 63 males) partners, personal details given by the index case were insufficient for identification of the partner.

**Conclusions** When asymptomatic, genital CT infection spreads among sexually active young adults with multiple, unidentified sexual partners, appropriate methods of partner notification are not sufficient to achieve its aims at the population level.

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Keywords

*Chlamydia trachomatis*, partner tracing, partner notification, youth health centres

Conflicts of interest

None declared

Introduction

Genital *Chlamydia trachomatis* infection has been notifiable since 1988. From 1989 to 1994, the reported number of cases in Sweden, as diagnosed by *C. trachomatis* culture and/or enzyme immunoassay, declined from 29,319 to 13,785. It was believed that legislative changes, which also include mandatory partner notification, were the major factor in this decline. Since 1995, however, the prevalence of *C. trachomatis* in Sweden has shown a constant annual increase in reported cases of approximately 15%. Moreover, since 1995, a dramatic shift has taken place in the number of reported cases of *C. trachomatis* infection from private practices and primary health care practitioners to the youth health centres, which together with the specialized dermato-venereology clinics, now report the majority of *C. trachomatis* infections in Sweden. The increased detection rate may in part be due to the routine introduction of new testing technologies, primarily nucleic acid amplification testing (NAAT), which is highly sensitive and can be performed on urine which is more acceptable, especially for men, leading to higher testing rates, but may also be explained by behavioural changes in the young adult population. Additionally, high rates of partner notification may contribute to the increase detection and notification of *C. trachomatis* infection.

As part of a case-finding strategy, current legislation requires physicians treating index cases to carry out partner notification, in
which all identifiable partners are contacted and informed that they have a duty to consult a primary health care practitioner and provide a specimen to establish whether they are infected. Free treatment is given to patients with a diagnosed C. trachomatis infection or even a suspected one. Physicians unable to trace and follow-up or to identify potentially infected persons must notify the county medical officer for communicable disease control (CMO) of this, after which the duty to provide partner notification services is transferred to the CMO.

The study, which was conducted in the context of the current rise in C. trachomatis cases, is part of the ongoing process of modifying and improving partner notification services. The purpose of the study was to analyse the contact tracing success rate of the partner notification services routinely provided by community-based youth health centres and the CMO in Uppsala County.

Methods

Study population
In Sweden, there have been youth health centres in each county since the late 1970s. These centres are municipality based and serve persons aged 13–23 years. The centres are accessible without charge, offer voluntary and personal choices for counselling without parent consent, and focus on a broad range of youth-health related issues. Staff personnel include a midwife with the authority to prescribe birth control pills, a psychologist and/or a social assistant and a consultant doctor in the field of gynaecology or venereology. The services are related to individual social and psychological issues of significance for teenagers and adolescents, contraception counselling, birth-control pill prescription, physical examination and screening for sexually transmitted infections (STIs) when indicated. Historically, 90% of the visitors to youth health centres have been females. However, in recent years, 20–25% of the new visitors have been male at some of the youth health centres that have actively focused on attracting young men by designating special, male-only visiting hours. The current study on the efficacy of partner tracing and partner notification was undertaken between 1 September 2003 and 31 August 2004 at seven community-based, youth health centres in Uppsala County. Each clinic serves between 1000 and 4000 youths in the age group 13–20 years, which represents 11–12% of the total population in their respective communities. The communities included one large city (187 541 inhabitants), one small city (38 768 inhabitants) and five market towns (1000–2561 inhabitants) with Chlamydia diagnosis rates per 100 000 adolescence in age groups 13–20 years for the three types of communities during 2004 of 3992, 2988 and 2681, respectively. Patients infected with C. trachomatis were treated free at the youth health centres according to established local guidelines (usually with oral doxycycline administered for 9 days) and subsequently participated in the partner notification service protocol in accordance with the Communicable Diseases Act. Each subject had a candid interview with a consultant physician (often a specialist in gynaecology or venereology) or an appointed specialist in disease intervention (DIS, psychologist or social assistant) about their sexual contacts. They were asked to give sufficient information to identify and locate their contacts during the 6 months preceding the date of diagnosis. Contacts are subjected for treatment exclusively after being tested. Regular partners are always treated. After the interview with the patient, the DIS attempted to locate and examine the named contacts or referred them to a primary health care practitioner of their own choice. This practitioner is obliged by law to inform the DIS/physician that the contact has been examined for C. trachomatis infection. Successful contact tracing for each episode was defined as the confirmed attendance of a sexual contact within 12 months after the contact with the index case. Confirmation was obtained by letter or verbally by phone. The youth health centres were asked to report the result of their successful partner notifications to the CMO during the study period. If the patient provides insufficient information to locate the contacts or if identified contacts refuse to make an appointment with a doctor, the doctor responsible for the management of the index case has a duty to report these contacts to the CMO. Routine tracing of a sexual contact is then undertaken by specialized STI advisers under the supervision of the CMO. Data were entered into a SMITT-ADM database package (Lotus Notes) and subsequently analysis was performed using the EXCEL statistical package for Windows (Microsoft Corp., Redmond, WA).

Laboratory tests
The serum samples were refrigerated at 2 °C to 8 °C during storage and transported to the microbiology laboratory within 24 h. Urine samples were evaluated by means of urine-based PCR with the use of the BDProbeTec™ system (Becton-Dickinson, Sparks, MD, USA).

Statistical analyses
Differences between groups were estimated by use of the chi-squared test and t-test. Difference with a P-value less than 0.05 was considered statistically significant.

Results
During the study period, the seven youth health centres in Uppsala County reported altogether 463 index cases (299 females and 164 males) with C. trachomatis infection. The reasons for testing of C. trachomatis-positive individuals are shown in Table 1. For C. trachomatis-positive females, the most common reason for testing was their concern of being exposed to infection, whereas for C. trachomatis-positive males, the provider or partner referral was the main reason for C. trachomatis testing. Opportunistic screening as a case-finding method diagnosed only 13% of the female and 7% of the male cases, while presenting with symptoms was observed in a minority of diagnosed patients, regardless of gender.
The female index cases reported 660 male sexual contacts and the males reported 386 female contacts, giving a mean of 2.2 male and 2.4 female partners, respectively, per index case. The number of sexual contacts during the 6-month period before diagnosis varied between 1 and 11 partners for the female index cases and between 1 and 14 partners for the male index cases (Table 2). When compared with the males, there was no significant difference in the proportion of female individuals having 1, 2, 3 or 4 and more sexual partners during the past 6 months (Table 2).

Successful partner notification was achieved for 470 of 660 male contacts (71%) with female index cases, which was significantly lower compared with the notifications services offered to female contacts reported by male index cases, where 292 out of 386 female contacts (76%) were successfully tested for C. trachomatis (Table 3). Within each gender, however, there was no difference in the success rate of the partner notification process in relation to the number of sexual partners given by the male and female index case, respectively. Thus, the success rate was equally good whether 1–4 partners or more were given by the index case. Of interest was the finding that the success rate of the partner notification process was highly dependent on the size of the community where the contact tracing was performed. As shown in Table 4, the success rate was significantly lower when the partner tracing and notification procedure was performed in the larger city compared with that of a smaller city or a market town.

The time needed for the confirmed visit of the notified contact to a primary health care practitioner was 1 month for 70% of the identifiable contacts, Moreover, 95% of the partner notifications were successfully concluded within 3 months of the C. trachomatis diagnosis of the index case. Of the total number of given sexual partners (n = 1046), the youth health centres reported 280 (190 males and 94 females), unsuccessful contact-tracing episodes to the CMO (Fig. 1). These contact-tracing episodes had been unsuccessful because too little personal details for identification of the contact had been obtained from the index case or because the identified contacts that had been notified refused to make an appointment with a primary health care practitioner to submit a specimen for C. trachomatis diagnosis or

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Table 1 Reasons for C. trachomatis testing at the youth-health centres according to gender

<table>
<thead>
<tr>
<th>Reason</th>
<th>Female</th>
<th>Male</th>
</tr>
</thead>
<tbody>
<tr>
<td>Offer</td>
<td>38</td>
<td>12</td>
</tr>
<tr>
<td>Partner referral</td>
<td>53</td>
<td>49</td>
</tr>
<tr>
<td>Provider referral</td>
<td>65</td>
<td>61</td>
</tr>
<tr>
<td>Worried/control</td>
<td>101</td>
<td>18</td>
</tr>
<tr>
<td>Symptom</td>
<td>42</td>
<td>24</td>
</tr>
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</table>

Table 2 Number of index cases according gender and number of reported sexual contacts

<table>
<thead>
<tr>
<th>Gender</th>
<th>Index cases</th>
<th>Contacts</th>
<th>Index cases</th>
<th>Contacts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>116</td>
<td>1</td>
<td>95</td>
<td>2</td>
</tr>
<tr>
<td>Male</td>
<td>50</td>
<td>3</td>
<td>19</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>85</td>
<td>2</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>50</td>
<td>3</td>
<td>1</td>
<td>12%</td>
</tr>
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<td></td>
<td>3</td>
<td>6</td>
<td>1</td>
<td>16%</td>
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<td></td>
<td>4</td>
<td>8</td>
<td>1</td>
<td>8%</td>
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<td></td>
<td>1</td>
<td>10</td>
<td>1</td>
<td>10%</td>
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<td></td>
<td>1</td>
<td>11</td>
<td>1</td>
<td>12%</td>
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<td></td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>14%</td>
</tr>
<tr>
<td></td>
<td>299</td>
<td>660</td>
<td>164</td>
<td>386</td>
</tr>
</tbody>
</table>

Table 3. Successful partner notification for contacts reported by male and female index cases

<table>
<thead>
<tr>
<th>Tested female contacts</th>
<th>Contact</th>
<th>Tested male contacts</th>
</tr>
</thead>
<tbody>
<tr>
<td>47/59</td>
<td>1</td>
<td>83/116</td>
</tr>
<tr>
<td>85/110</td>
<td>2</td>
<td>138/190</td>
</tr>
<tr>
<td>53/72</td>
<td>3</td>
<td>108/150</td>
</tr>
<tr>
<td>107/145</td>
<td>4</td>
<td>141/204</td>
</tr>
</tbody>
</table>

Table 4 Successful partner notification in relation to community size

<table>
<thead>
<tr>
<th>Health centre</th>
<th>n</th>
<th>(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Large city</td>
<td>183/281</td>
<td>65%</td>
</tr>
<tr>
<td>Small city</td>
<td>103/134</td>
<td>77%</td>
</tr>
<tr>
<td>Market town</td>
<td>52/64</td>
<td>81%</td>
</tr>
</tbody>
</table>

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Figure 1 Percentage of successful partner notifications among reported contacts carried out by the CMO. Not identified: 134 individuals of 1046 contacts (13%). *P < 0.001 (n = number).
because they were living outside Sweden. Among this cohort of contacts, sufficient details were obtained for 150 individuals (54%) for contact tracing carried out by the CMO, and referral to a practitioner with subsequent testing, diagnosis and treatment, if considered needed. The success rate was significantly higher for the male contacts (63%) compared with the female contacts (33%; \( P < 0.001 \)). However, 134 individuals (71 males and 63 females) remained unidentified after the intervention by the CMO and thus could not be reached by appropriate partner notification methods. This group of individuals constituted 13% (134 of 1046) of all given sex partners.

**Discussion**

Partner notification refers to the provision of a service in which all the recent sexual partners of a STI patient can be ordered by law to present themselves at STI centres for examination, treatment, education and counselling. The partner notification is aimed at the timely detection and early treatment of STIs in partners in order to effectively control the further transmission of STI, to reduce the burden of infection in the community and to decrease the rate of complications. The results of notification can also aid in establishing local epidemiology and subsequent resource allocation. Methods of partner notification mainly include notification by patients themselves. This is known variously as a self, patient, or client referral approach. The use of public health professionals to gather identifying and locating information about sex partners of infected persons and notify these persons after obtaining permission from patients is most widely known as public health-mediated or provider referral.

In Sweden, we believe that partner notification is the most effective strategy to reduce the transmission of non-symptomatic or mildly symptomatic STI, of which *C. trachomatis* infection is one important example. Consequently, Swedish doctors have an obligation by law to offer partner notification services to their patients infected with *C. trachomatis*. *C. trachomatis* infection is widely spread among teenagers and young adults in Sweden. In Uppsala County (a population of nearly 300 000), which is located close to the Stockholm urban area, the incidence reached 2817 per 100 000 in the 15- to 24-year age group in 2004. Women infected with genital *C. trachomatis* may develop reproductive sequelae, including infertility and ectopic pregnancy.\(^6\)\(^7\) The proposition that *C. trachomatis* is a potential cofactor in the progression of oncogenic papillomavirus infection to cervical cancer is currently under debate.\(^6\)\(^7\) In men, the infection accounts for 30–50% of visits to clinics for sexually transmitted diseases for non-gonococcal urethritis.\(^10\)\(^11\) However, an often unrecognized aspect of STI, including bacterial STI, is how frequently persons with these infections have no symptoms or do not recognize the symptoms. In both genders, clinical signs and symptoms of *C. trachomatis* infection are mild or non-specific in up to 70% of infected cases\(^12\) and the perpetuation of infection may be explained by describing the identified cases metaphorically as the tip of the iceberg.

Establishing STI clinical services in non-clinical, institutional or community settings is typically more expensive than clinic-based approaches but can yield substantial benefits if services are extended to persons at higher than average risk of acquiring or transmitting STIs within communities.\(^13\)\(^14\) Previous studies in Sweden have shown that attendance rates for identified partners of *C. trachomatis*-infected patients in primary health care setting changed from 72% in 1980 (before the Communicable Diseases Act)\(^15\) to 99% in 1993.\(^4\) However, there have previously been few measurements of the effectiveness of the partner notification carried out by the youth health centres in Sweden. We demonstrated in an earlier study that the efficacy of the partner notification services offered by youth health centres in the Stockholm urban area was 56% of all given contacts that were traced and notified, regardless of gender.\(^16\) In the current study, the efficacy of the partner notification services performed in small communities by DIS that received formal training before beginning work and often subsequent on-the-job training and refresher training were even better, reaching as high as 81% to 87% in these smaller communities, which, interestingly, also had a lower incidence of *C. trachomatis* compared with the large city. These results suggest that, additional to the widespread availability of good quality, clinical STI services, which are essential to ensure that infections are detected and treated to reduce the risk of STI transmission, successful contact tracing of sexual partners of *C. trachomatis*-infected patients is highly dependent upon sufficient details of the sexual partners being provided by the index case so that identifications can be made. Once the partner has been identified and contacted, the attendance rate is very high in the primary health care setting,\(^17\) as well as in youth health centres, as shown in the current study. However, the present study also found that the success rate in partner notification carried out at the youth health clinics was dependent upon the gender of the notified partner. After notification, males attended less often than notified females, suggesting that males are not as motivated to examine themselves in the absence of genital symptoms. Contact tracing of sexual partners is a time-consuming, labour-intensive process based on confidence, trust and cooperation. In Sweden, it has been shown that the patients of professional STI advisers report significantly more partners than the patients of primary health care practitioners.\(^18\)

In a study in 1997 in Stockholm County among primary health care practitioners and private practitioners, one in three did not initiate partner notification and one in five reported telling patients that their partner needed medical examination without checking the outcome of partner notification.\(^19\) Moreover, in our own observations, we found that primary health care and private health care providers, in comparison with youth health centres and hospital venereal clinics, rarely report unsuccessful partner notification to the CMO. Taken together, these data suggest that a large number of sex contacts are not appropriately notified or reported by primary health care practitioners to the CMO, primarily because they have no or few personal details of the contact to
Partner notification in youth health centers

lead to desired changes in knowledge, attitudes, perceptions, self-efficacy, skills and behaviour, such as positive changes in male condom use, a reduction in the number of sexual partners, and a decrease in the practice of unprotected sexual intercourse. We support the view that any intervention providing active health information to young people at risk of STI may yield such changes. If more widely adopted, these strategies may have an impact on the spread of genital C. trachomatis and other STIs and thus improve the reproductive health of young women and men.

References
17 Carré H, Roman J, Osterlund A, Garden B, Nylander E. Improved contact tracing for Chlamydia trachomatis with experienced tracers, interviewing for one year back in time and by phone in remote areas. Sex Transm Inf published online 23 Jan 2008, doi:10.1136/sti.2007.028068

report and thus assume that a report to the CMO will be meaningless. This notion is further supported by the finding in our study that the mean number of partners per index case is significantly higher when partner notification is carried out by the youth health centres than what has previously been reported for primary health care practitioners in Sweden. Therefore, it seems prudent to recommend that contact tracing should be delegated to a social worker, a registered nurse, a registered midwife or a disease intervention specialist with an interest in and keen knowledge of the partner notification process.

Among the unsuccessful partner notification episodes reported by the youth health centres to the CMO, 63% of the notified males who initially did not respond to the public health-mediated referral did attend after a more intensive intervention from the CMO. In contrast, a significantly higher rate of female partners could not be traced for notification by the CMO because there were so few personal details of the female sexual partners obtained from the male index cases for identification to be made. Thus, 13% of all contacts (i.e. 134 of 1046) reported by the index cases could not be traced for notification by the CMO because there were so few personal details of the female sexual partners obtained from the male index cases for identification to be made. Thus, 13% of all contacts (i.e. 134 of 1046) reported by the index cases could not be reached by appropriate methods of contact tracing and partner notification.

Recent data suggested that sexual intercourse with many different partners was the predominant risk factor for C. trachomatis infection, and we have previously shown that contact tracing and partner notification were less effective in this group of individuals in the Stockholm urban area. We believe that partner notification alone may not be sufficient for optimal reduction in the spread of C. trachomatis infection and that targeted screening programmes among sexually active people should be implemented as part of a case-finding strategy. We and others have previously suggested that prevention programmes based on a case-finding strategy should also focus on repeated testing of individuals of both gender that have had a STI during the preceding year. In addition to intensified contact tracing by DIS for patients with repeated C. trachomatis infections, such an extended follow-up may, in combination with risk reduction counselling, contribute to a decrease in the pool of infectious individuals.

By their nature, non-invasive, amplification methods of C. trachomatis detection offer the opportunity for cost-effective screening of youths outside traditional facilities, including schools and homes, and possibly with the use of the internet. Thus, although self-sampling for C. trachomatis may become of great use in the future, the challenge will be to integrate these innovations into a comprehensive yet cost-effective, youth-orientated system of STI prevention that includes active, population-based information, as well as individual counselling when test results are positive.

We believe that a comprehensive approach to adolescent health should include the development of aggressive, youth-centred and youth-targeted campaigns to help initiate and maintain healthy choices, instead of simply addressing the unintended consequences of high-risk activity.


31 Schachter J. Chlamydia trachomatis: the more you look the more you find—how much is there? Sex Transm Dis 1998; 25: 229–231.


37 Shriver M. Enhanced adolescent STD prevention projects. Commentary on 'Accelerated Campaign to Enhance STD services (ACCSESS) for youth: successes, and lessons learned'. Sex Transm Dis 1999; 26 (Suppl.): S42–S43.

