European Journal of Public Health, Vol. 22, No. 4, 556–561

doi:10.1093/eurpub/ckr046 Advance Access published on 29 April 2011

Chlamydia control activities in Europe: cross-sectional survey

Nicola Low[1], Jackie A. Cassell[2], Brenda Spencer[3], Nicole Bender[1], Adriane Martin Hilber[4], Jan van Bergen[5], Berit Andersen[6,7], Björn Herrmann[8], Françoise Dubois-Arber[3], Françoise F. Hamers[9], Marita van de Laar[10], Judith M. Stephenson[11]

1 Division of Clinical Epidemiology and Biostatistics, Institute of Social and Preventive Medicine, University of Bern, Bern, Switzerland
2 Division of Public Health and Primary Care, Brighton and Sussex Medical School, University of Sussex, East Sussex, UK
3 Unit for the Evaluation of Prevention Programmes, Institute of Social and Preventive Medicine (IUMSP), Centre Hospitalier Universitaire Vaudois and University of Lausanne, Epalinges, Switzerland, Institute of Social and Preventive Medicine, University of Lausanne, Lausanne, Switzerland
4 Swiss Centre for International Health, Swiss Tropical and Public Health Institute, Basel, Switzerland
5 STI AIDS Netherlands, SOA AIDS, Amsterdam, The Netherlands
6 Research Unit for General Practice, Aarhus University, Aarhus, Denmark
7 Department of Public Health Programs, Randers Regional Hospital, Central Region Denmark
8 Department of Medical Sciences, Section of Clinical Bacteriology, Uppsala University, Uppsala, Sweden
9 Service de l'Evaluation Economique et de Santé Publique, Haute Autorité de Santé, Paris, France
10 European Centre for Disease Prevention and Control, Stockholm, Sweden
11 Research Department of Reproductive Health, Institute of Women's Health, University College London, London, UK

Correspondence: Nicola Low, Institute of Social and Preventive Medicine, University of Bern, Finkenhubelweg 11, Bern, CH-3012, Switzerland, tel: +41 31 631 3092, fax: +41 31 631 3520, e-mail: low@ispm.unibe.ch

Background: Chlamydia is the most commonly reported bacterial sexually transmitted infection in Europe. The objective of the Screening for Chlamydia in Europe (SCREen) project was to describe current and planned chlamydia control activities in Europe. **Methods:** The authors sent a questionnaire asking about different aspects of chlamydia epidemiology and control to public health and clinical experts in each country in 2007. The principles of sexually transmitted infection control were used to develop a typology comprising five categories of chlamydia control activities. Each country was assigned to a category, based on responses to the questionnaire. **Results:** Experts in 29 of 33 (88%) invited countries responded. Thirteen of 29 countries (45%) had no current chlamydia control activities. Six countries in this group stated that there were plans to introduce chlamydia screening programmes. There were five countries (17%) with case management guidelines only. Three countries (10%) also recommended case finding amongst partners of diagnosed chlamydia cases or people with another sexually transmitted infection. Six countries (21%) further specified groups of asymptomatic people eligible for opportunistic chlamydia testing. Two countries (7%) reported a chlamydia screening programme. There was no consistent association between the per capita gross domestic product of a country and the intensity of chlamydia control activities ($P = 0.816$). **Conclusion:** A newly developed classification system allowed the breadth of ongoing national chlamydia control activities to be described and categorized. Chlamydia control strategies should ensure that clinical guidelines to optimize chlamydia diagnosis and case management have been implemented before considering the appropriateness of screening programmes.

Introduction

Sexually transmitted *Chlamydia trachomatis* is the most frequently reported of all notifiable infections in several industrialized countries and reported diagnoses are increasing.[1–3] Chlamydia prevalence is highest in women <25 years and men <30 years: 2–6% of adults in the general population in high-income countries are estimated to be infected,[4–8] and most are asymptomatic.[8] Untreated chlamydia can cause infertility and ectopic pregnancy in women and epididymo-orchitis in men.[9] Chlamydia is associated with adverse pregnancy and neonatal outcomes and facilitation of HIV transmission.[9]

The general principles of sexually transmitted infection control include early diagnosis and effective treatment of infected cases and, through partner notification, sexual partners who might have infected the case or might have been exposed to infection.[10] Screening of asymptomatic individuals is frequently recommended as an intervention[11–14] since >95% of chlamydia-infected women and men in population-based surveys are asymptomatic.[8] The ways in which case management, screening, surveillance and other components of chlamydia control are incorporated into communicable disease control programmes in different countries are, however, not well understood. The objectives of this study were to describe the range and intensity of existing and planned chlamydia control activities in Europe.

Methods

The Screening for Chlamydia Review in Europe (SCREen) project was conducted between November 2006 and January 2008. The methods and results are described in detail in a technical report.[15] The project was commissioned by the European Centre for Disease Prevention and Control (ECDC) to investigate public health activities that contribute to the control of sexually transmitted genital *C. trachomatis* in Europe and to aid development of guidance for European Union Member States.[16] We invited all Member and candidate states of the European Union (as of November 2006) and countries in the European Free Trade Association (EFTA); Iceland, Liechtenstein, Norway and Switzerland.

We designed a structured questionnaire in English, which asked about: the existence, audience and content of guidelines on the management of genital chlamydia; laws and policies about sexually transmitted infection control; diagnosis of chlamydia; surveillance of chlamydia and its complications; the organization of and payment for clinical services; existing or planned screening programmes; and publications about chlamydia prevalence and sexual behaviour, if available. These data were supplemented by inclusion in the database of economic and demographic information on each country.

The questionnaire was sent in January 2007 by e-mail or post to public health and clinical experts in each country, identified through lists of

representatives of the European Surveillance for Sexually Transmitted Infections network and the International Union against Sexually Transmitted Infections Europe group. They were asked to involve experts with specialist knowledge if they themselves did not know the answers. We sent multiple reminders. Country representatives reviewed the preliminary analysis; the data used in this report include all responses, amendments and clarifications received by 14 January 2008.

We developed a system for classifying chlamydia control activities at the country level using items from the questionnaire and the principles of sexually transmitted infection control.[10] The resulting categories described criteria that required increasing technical and organizational capacity for implementation (Supplementary Web table S1). Case management for diagnosed cases was assessed from guidelines, which we considered an essential requirement for delivering and monitoring consistent care. Case finding for partners of diagnosed cases was considered a requirement for chlamydia control and documentation of this in guidelines was required. We made two categories for activities aimed at early chlamydia detection. Opportunistic chlamydia testing was defined as testing offered to groups of asymptomatic patients attending health-care settings, where the onus is on the health professional to repeat the offer at regular intervals.[17] A chlamydia screening programme was defined as organized systematic screening as part of the public health system. We assessed screening programme activities against a published checklist.[18]

Questionnaire data were reviewed by two pairs of project team members. Each pair examined one half of the participating countries and each member of the pair independently assigned the relevant country to a category. No reviewer assessed data from their own country. Discrepancies were resolved by discussion or the decision of a third person. Where the activities of a country spanned different categories, we assigned the lowest.

Data were entered into an Access (Microsoft Office) database. The data were summarized descriptively. We made a limited number of statistical comparisons using Kruskal–Wallis tests for non-normally distributed continuous data and chi-squared tests for categorical data. We use the term 'sexually transmitted infection specialists' to refer to all such specialists, including dermatovenereologists and genitourinary medicine specialists.

Results

Of the 33 invited countries, we received responses from more than 80 experts in a total of 29 (88%) countries. We could not collect information from Croatia, Cyprus, Poland and Slovakia.

Clinical practice guidelines

Among 29 participating countries, experts in 17 reported 32 sets of guidelines for the management of genital chlamydial infection endorsed by a nationally recognized professional organization (table 1). Three countries were in the process of publishing or preparing guidelines and nine had no guideline. Ten countries had a guideline intended for all practitioners. In four of these different professional groups had developed separate guidelines (table 1). The content of different guidelines in the same country was sometimes inconsistent. In The Netherlands, for example, a guideline for all practitioners is published by the Institute for Healthcare Quality. There are separate guidelines for primary care, sexually transmitted infection specialists, gynaecologists and municipal health service staff. The eligible age groups and recommendations about repeat testing differ. Audit[19] of adherence to guidelines was only practised in genitourinary medicine clinics in the UK.

Availability of chlamydia testing

Chlamydia testing was available in many settings, including all 26 participating countries with specialist clinics and gynaecology clinics in all 29 countries (table 2). In 17 countries, gynaecology clinics were the most likely setting for chlamydia testing. Chlamydia testing was also available in most countries in urology, primary care and family planning clinics. In five countries, chlamydia testing kits could be bought in pharmacies or other over-the-counter outlets. Settings where chlamydia testing could be carried out were not always covered by case management guidelines. In 16/29 countries where chlamydia testing was available in gynaecology clinics, there was no clinical guideline, i.e. no guideline applicable to all practitioners. In nine of these countries, this was the most common setting for chlamydia testing. Nearly half (12/26) of countries with specialist sexually transmitted infection clinics did not have a guideline for these practitioners (table 2).

Partner notification

Of 32 guidelines, recommendations about partner notification were included in 26. In most non-specialist settings where chlamydia testing was offered, partner notification was reported to be initiated by the

Table 1 Coverage of chlamydia case management guidelines in Europe

Guideline audience (*N* = 29)	Countries
Single guideline for all practitioners (*n* = 6)	Estonia, Hungary, Iceland, Lithuania, Norway, Romania
Guideline for all practitioners PLUS separate specialist guidelines[a] (*n* = 4)	Belgium, Czech Republic, Sweden, The Netherlands
Sexually transmitted infection specialists only (*n* = 3)	Austria, France, Italy
Guideline for sexually transmitted infection specialists PLUS separate specialist guidelines[b] (*n* = 2)	Latvia, UK
Primary care practitioners only (*n* = 1)	Denmark
Antenatal clinics/urology only (*n* = 1)	Germany
Guideline in preparation[c] (*n* = 3)	Bulgaria, Finland, Greece
No guideline[c] (*n* = 9)	Ireland, Liechtenstein, Luxembourg, Malta, Portugal, Slovenia, Spain, Switzerland, Turkey

a: Includes any combination of dermatovenereology, primary care, gynaecology, youth clinics, municipal health services
b: Includes gynaecology (Latvia), tests being done for chlamydia screening programme (UK, England only)
c: As of January 2008. Adapted from Table 5, Ref. 15.

Table 2 Availability of chlamydia testing and of clinical guidelines in specified settings

Setting	Chlamydia testing available, *n*	Most common setting, *n*[a]	Practitioners not covered by guideline[b], *n* (%)
Gynaecology	29	17	16 (55)
Sexually transmitted infection clinic	26	2	12 (46)
Urology	25	3	17 (68)
Primary care	23	11	13 (57)
Family planning	22	2	13 (62)
Internal medicine	11	0	7 (64)
Emergency department	10	0	6 (60)
Pharmacy	5	0	Not known[c]

a: Countries could rank more than one setting as the most likely place for testing, so total is more than the number of countries
b: Denominator is number of countries in which chlamydia testing is available at each setting
c: Questionnaire did not ask whether guidelines covered non-clinical settings. Reproduced from Table 8, Ref. 15.

physician in the clinic. In a minority of countries respondents explicitly noted that no partner notification took place. This was most frequently reported about family planning clinics (5/22).

Laboratory diagnosis

Nucleic acid amplification tests for chlamydia diagnosis, which are the most accurate but also the most expensive assays,[20] were available to some extent in all but one country (Bulgaria) but were not always available for routine testing. The percentage of tests analysed using nucleic acid amplification tests was <10% in five countries, 10–49% in four, 50–90% in five and >90% in 11. There was statistical evidence of an association between increasing per capita gross domestic product (GDP) and the level of nucleic acid amplification testing ($P = 0.003$). Countries in which laboratories took part in diagnostic quality assurance schemes were more likely to also have clinical guidelines for at least one group of health professionals (15/19) than those that did not (4/10, $P = 0.036$).

Surveillance for chlamydia

Most countries (25/29) reported some system for surveillance of chlamydia infections. The most common method was a statutory requirement for reporting of all laboratory diagnosed cases (15 countries). Seven countries conducted surveillance in selected sentinel sites or with reporting only from sexually transmitted infection clinics. Nine countries did not publish surveillance data about chlamydia and in three countries reporting from laboratories was voluntary. The recorded rate of diagnosed chlamydia differed markedly between countries, even within the group where reporting of diagnosed cases was reported to be compulsory (figure 1).

Categorization of chlamydia control activities

The category to which each country was assigned is shown in table 3. There was no consistent association between median GDP across categories of chlamydia control activities ($P = 0.816$). The group with no organized activity included countries in Europe with the highest (Liechtenstein and Luxembourg) and lowest (Turkey and Bulgaria) per capita GDP.

No organized chlamydia control activity

The largest category (13/29, 45%) was of countries that were defined as having with no current activities because they did not have a nationally recommended guideline, or because the availability of services was very limited (table 3). Six countries in this group stated plans to introduce chlamydia screening programmes.

Case management for diagnosed chlamydia

There were five countries (17%) in this group (table 3). The guidelines in Lithuania and the Czech Republic applied to all practitioners. They applied only to sexually transmitted infection specialists in Austria and Italy, and gynaecologists and urologists in Germany. Chlamydia testing in these countries was usually, however, widely available in other clinical settings (table 1).

Case finding for partners of infected cases

Three countries (10%) were included in this category (table 3). Although case management guidelines for other countries were reported to cover partner notification, we only included those that explicitly stated that partners of diagnosed chlamydia cases or people with another sexually transmitted infection should be offered chlamydia testing.

Opportunistic chlamydia testing

Six countries (21%) specified groups of asymptomatic people eligible for chlamydia testing at selected settings (table 3). The groups offered testing differed between countries but most commonly included sexually active adolescents and young adults with multiple sexual partners or a recent change of partner, and women undergoing uterine instrumentation. In Sweden, opportunistic chlamydia testing takes place across the country in a variety of clinical settings. Diagnosis and treatment are free and partner notification is mandatory.[21]

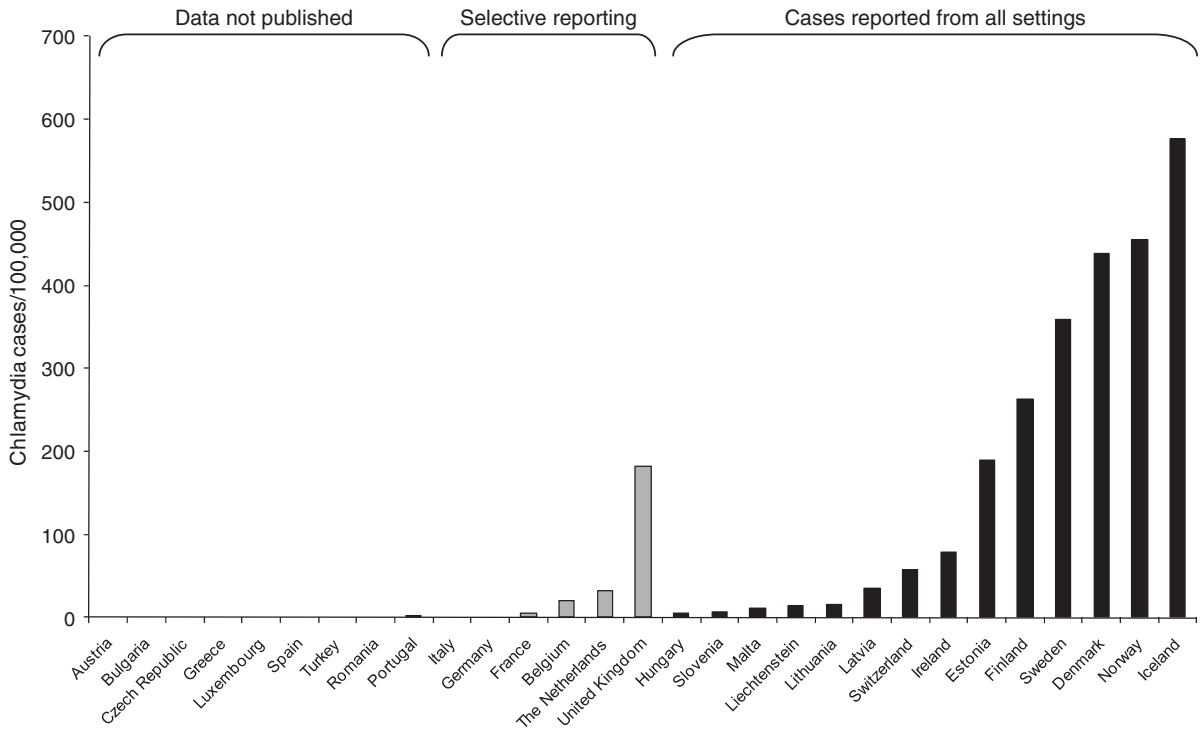

Figure 1 Rate of diagnosed chlamydia cases per 100 000 population in Europe, 2005 or 2006. Figure includes data from all countries that provided data about reported chlamydia cases in 2005 or 2006. Numerator is the number of diagnosed chlamydia cases reported; denominator is the total mid-year population of the country in the year of data collection. Countries with selective reporting include those that publish data about all cases reported from sentinel sites, including countries that report all cases diagnosed in specialist clinics. Countries with no apparent cases either did not provide data, or did not have data available. Reproduced from Figure 4, Ref. 15

Table 3 Level of chlamydia control activities for European countries participating in project SCREen

Country	Comments
No organized chlamydia control activity (*n* = 13)	
Bulgaria	Case management guideline, planned publication January 2008. Screening programme planned.
Finland	Case management guideline planned for development 2008. Opportunistic programme planned.
Greece	No case management guideline. Screening programme planned.
Ireland	No case management guideline.
Liechtenstein	No case management guideline.
Luxembourg	No case management guideline. Opportunistic screening programme planned.
Malta	No case management guideline.
Portugal	No case management guideline.
Romania	Case management guideline for all practitioners, but very limited facilities for testing in practice.
Slovenia	No case management guideline. Screening programme planned.
Spain	No case management guideline.
Switzerland	No case management guideline.
Turkey	No case management guideline. Screening programme planned.
Case management for diagnosed chlamydia cases (*n* = 5)	
Austria	Case management guideline for sexually transmitted infection clinics. Chlamydia testing available in other settings but partner notification done in primary care only.
Czech Republic	Case management guideline for all practitioners deals with diagnosis but not treatment or partner notification. Partner notification reported to be by referral to specialist clinic.
Germany	Case management guideline for gynaecology (pregnant women) and urology. Chlamydia testing not done in primary care. Partner notification reported to be done by practitioner in gynaecology (where most tests are done), urology, internal medicine, but not in family planning clinics.
Italy	Case management guideline for sexually transmitted infection clinics. Chlamydia testing for symptomatic people only. Chlamydia testing and partner notification available in other settings.
Lithuania	Case management guideline for all practitioners includes partner management, but no list of who should be offered chlamydia testing and, in practice, said not to take place.
Case finding for partners of diagnosed chlamydia cases (*n* = 3)	
Belgium	Partner management included in guideline for primary care (where most tests are done) and gynaecology. Primary care guideline includes testing only for female partners of symptomatic men.
France	Case management guideline for sexually transmitted infection clinics. Testing recommended for partners of cases with sexually transmitted infection. Chlamydia testing available in many other settings and partner notification reported to be done by patient referral initiated by practitioner. Screening programme planned.
Hungary	Case management guideline for all practitioners, including chlamydia testing for all sexual partners of symptomatic patients with a sexually transmitted infection. In practice, partner notification might not take place.
Opportunistic testing for selected asymptomatic individuals (*n* = 6)	
Denmark	Guideline includes opportunistic chlamydia testing in primary care (where most tests are done) for asymptomatic people with frequent sex partner change, women <26 years before intrauterine device insertion or hysterosalpingogram. Also annual postal invitation for screening in two communities.
Estonia	Guideline for all practitioners includes opportunistic testing for pregnant women and asymptomatic people with frequent sex partner change, clients of commercial sex workers, following sexual assault.
Iceland	Guideline for all practitioners includes opportunistic testing for women presenting for termination of pregnancy, egg and sperm donors.
Latvia	Opportunistic testing recommended for pregnant women. Partner management included in guideline for sexually transmitted infection and gynaecology clinics, including chlamydia testing for partners of patients with a sexually transmitted infection. Partner notification done by practitioner or by referral to specialist clinic.
Norway	Guideline for all practitioners includes opportunistic testing for women presenting for termination of pregnancy or antenatal care, <25 s with recent partner change, and partners of people with a sexually transmitted infection. Plans for proactive chlamydia screening by postal invitation following randomized controlled trial in one region.
Sweden	Multiple guidelines for different practitioners. Include opportunistic testing for asymptomatic people with target groups differing between counties.
Organized chlamydia screening programme (*n* = 2)	
The Netherlands	Pilot chlamydia screening programme began March 2007. Annual postal invitation for chlamydia screening to all 16–29 year olds in three regions from September 2008.
UK (England)	Opportunistic chlamydia screening offered to all sexually active <25-year-olds attending various clinical and non-clinical settings (depending on health district). Rolled out 2003 to March 2007.

Reproduced from Table 14, Ref. 15.

Chlamydia screening programmes

Two countries (The Netherlands and the UK, 7%) reported a chlamydia screening programme covering a substantial part of the population that was ongoing or was being conducted as a pilot programme (table 3). In the UK, chlamydia screening was introduced in England in 2003 and rolled out across that country by the end of 2007.[22] Screening tests are offered opportunistically to sexually active women and men aged <25 years attending selected settings, depending on the area and, in some places, through outreach activities. When assessed against the checklist of Gray,[18] most criteria were fulfilled, but the proportion of positive cases was not accepted as a valid performance measure of chlamydia prevalence, and incidence of complications was planned but not implemented. The programme did not cover Scotland, Wales or Northern Ireland. In The Netherlands, the Chlamydia Screening Implementation project is a pilot programme in three regions of the country, which began in March 2007.[23] Chlamydia screening invitations are delivered at yearly intervals to men and women aged 16–29 years using population registers. Recipients request a home sampling kit through a web-based application. In two regions, all those in the target age group are invited; in one region eligibility is assessed by a web-based questionnaire. The main objectives and performance measures were valid. The programme will be evaluated using a randomized design. In both programmes there were features that were still under development.

Nine countries reported plans to introduce chlamydia screening programmes in the future, including six with no current chlamydia

control activities (table 3). Four programmes are planned to be delivered using an opportunistic approach (Finland, France, Greece, Luxembourg), compared with one (Norway) planned as a proactive, register-based programme. In four countries, the target population includes specific groups at high risk of chlamydia such as sex workers (Greece, Turkey), Roma (Bulgaria) and attenders at sexually transmitted infection clinics (France, Greece).

Monitoring the outcomes of chlamydia control activities

Three countries (France, England in the UK and The Netherlands) reported existing or planned performance targets. In England, there were no indicators measuring the primary outcomes of the screening programme (reduced reproductive tract complications and transmission). In The Netherlands, proposed indicators include changes in population prevalence and pelvic inflammatory disease incidence as well as uptake of repeated screening invitations. The specific indicators in France were not reported. Informants from four countries that reported plans to introduce chlamydia screening (Bulgaria, Germany, Greece, Norway), reported that routine data about the complications of chlamydia were not collected.

Discussion

This study identified wide variation across 29 European countries in the range and intensity of activities that contribute to the control of sexually transmitted chlamydia infections. Surveillance data showed the differences between countries in reported rates of diagnosed cases. Seventeen countries had at least one guideline about the diagnosis and management of chlamydia infections. Thirteen countries have no organized activities aimed at chlamydia control; five have organized case management; three undertake additional case finding activities; seven recommend opportunistic testing and two reported an ongoing or pilot screening programme.

A major strength of the SCREen project was the collection and synthesis of comparable information about a wide range of sexually transmitted infection control activities, with a high response rate. The survey included countries in Central and Eastern Europe that are Member States of the European Union. The involvement of informants from different disciplines enabled collection of information about diverse areas of policy and practice. A weakness of this study is that it only gives a cross-sectional overview at the national level, masking potentially important regional differences in countries with devolved funding. Furthermore, we probably obtained more accurate information about what is recommended than about actual practice. Despite using structured questions, there was inevitably some room for them to be interpreted differently by different respondents, particularly since the questionnaire was only written in English. This might have led to misclassification, although we tried to obtain clarification and key informants commented on the draft report.[15] Reliability of categorization was increased by having two assessments, but could have been improved by having a third external assessor.

The wide range of policies and practices might reflect a lack of agreement about the most appropriate and effective chlamydia control measures. Reviews of the evidence available show that there are effective tools for the prevention, diagnosis, antibiotic treatment and partner management of sexually transmitted infections, including chlamydia.[24] There is also evidence from randomized controlled trials[25–27] that the incidence of PID in women might be reduced by about half with high uptake (64–100%) of a single round of testing and treatment. There is an absence, however, of empirical evidence from studies with a low risk of bias about the relationship between the intensity of chlamydia control and the impact on transmission.[28] Screening programmes are the most organizationally demanding of control measures.[18,29] This survey found that the performance measures for the English screening programme did not include the primary outcomes. An independent evaluation of the English programme in 2009 also found that the programme had been introduced without robust data about population prevalence or evidence for the effectiveness of screening.[30] The first priority for research is, therefore, to establish the relationship between the intensity of chlamydia control activities and their impact on chlamydia prevalence and reproductive tract morbidity. The Dutch Chlamydia Screening Implementation project included in this study will be the first pragmatic population-based randomized trial worldwide to determine whether or not the benefits of proactive register-based chlamydia screening can be achieved and sustained over multiple rounds.[23] A randomized trial that began in 2010 in Australia will provide information about the effectiveness of opportunistic chlamydia screening in reducing chlamydia prevalence in 2014–15.[31]

A report about screening policies in European Union Member and Applicant States included unstructured descriptions about chlamydia screening in 2004,[32] which were broadly consistent with this study. The advantage of the present study was that we used uniform definitions that allowed the categorization of countries. Of note, both surveys reported that there was no organized chlamydia screening programme in Sweden because the widespread opportunistic screening activities are not nationally coordinated. Chlamydia screening activities have previously been widely described as an organized programme by both Swedish[33,34] and international researchers and public health organizations.[35]

Disease control programmes for sexually transmitted infection should provide primary prevention and comprehensive case management.[24] These are features of disease control that should be optimized [14] before considering screening programmes.[36] The consistency and quality of case management are more likely to be assured if clinical guidelines are in place and adherence to them is audited. It is, therefore, notable that this study identified several countries that reported plans to introduce screening programmes, yet had no nationally recognized guidelines for the management of diagnosed cases or their partners. Furthermore, while the UK was the only country in which clinical audit was a routine practice, this took place only in genitourinary medicine clinics. The study also showed that partner notification was not always integrated into chlamydia case management, or was not always done even when recommended. Partner notification efforts seem likely to be suboptimal if practitioners are working in settings that are not covered by any guidelines.

The SCREen project provides baseline information about chlamydia control activities in place in 2007 in European countries and has informed a guidance document for European Union Member States.[16] The results of this survey and the guidance document can be used to audit progress in the development of chlamydia control strategies, with assessment against measurable standards.[19] An update of the survey would provide valuable information to monitor changes in the intensity of chlamydia control activities at country level, introduction of planned activities and adoption of recommendations. Of interest, economic resources did not seem to be associated with the priority assigned to chlamydia control in participating countries. The results of this survey indicate that the majority of chlamydia infections in the populations of European countries continue to go undetected with the risk of subsequent complications and onward transmission. Chlamydia control strategies should ensure that there are primary preventive activities and clinical guidelines to optimize chlamydia diagnosis and case management before considering the appropriateness of screening programmes.

Supplementary data

Supplementary data are available at *Eurpub* online.

Acknowledgements

The authors would like to acknowledge the contributions made by experts in participating countries in providing data and Dr Keith Radcliffe for contacting members of the International Union against Sexually Transmitted Infections Europe group on our behalf. F.F.H. was at the European Centre for Disease Prevention and Control, Stockholm, Sweden when this project was done. A.M.H. was at the Institute of Social and Preventive Medicine, University of Bern, Bern, Switzerland when this project was done.

Funding

This work was funded by the European Centre for Disease Prevention and Control, contract number ECD.290. Part of this work was undertaken at UCLH/UCL who received a proportion of funding from the Department of Health's National Institute for Health Research Centres funding scheme. We are grateful for the support of the Margaret Pyke Trust which contributes to the programme of reproductive health research at UCL.

Conflicts of interest: None declared.

Key points

- *Chlamydia trachomatis* is the most commonly notified sexually transmitted infection in most developed countries.
- The most effective and cost-effective strategies for controlling chlamydia transmission are not known.
- Activities that contribute to chlamydia control vary widely in Europe, with many countries having no organized activities.
- Chlamydia control strategies should ensure that clinical guidelines to optimize chlamydia diagnosis and case management have been implemented before considering the appropriateness of screening programmes.

References

1 National Centre in HIV Epidemiology and Clinical Research. HIV, viral hepatitis and sexually transmissible infections in Australia. Annual Surveillance Report 2010. National Centre in HIV Epidemiology and Clinical Research. Sydney, NSW: The University of New South Wales.

2 Centers for Disease Control and Prevention. *Sexually Transmitted Disease Surveillance 2009*. Atlanta: US Department of Health and Human Services, 2010.

3 Swedish Institute for Infectious Disease Control. *Chlamydia infection*. Summary http://www.smittskyddsinstitutet.se/in-english/statistics/chlamydia-infection-/ (8 April 2011, date last accessed).

4 Hocking JS, Willis J, Tabrizi S, et al. A chlamydia prevalence survey of young women living in Melbourne, Victoria. *Sex Health* 2006;3:235–40.

5 Andersen B, Olesen F, Moller JK, Ostergaard L. Population-Based Strategies for Outreach Screening of Urogenital Chlamydia trachomatis Infections: A Randomized, Controlled Trial. *J Infect Dis* 2002;185:252–8.

6 van Bergen J, Gotz H, Richardus JH, et al. Prevalence of urogenital *Chlamydia trachomatis* increases significantly with level of urbanisation and suggests targeted screening approaches: results from the first national population-based study in the Netherlands. *Sex Transm Infect* 2005;81:17–23.

7 Fenton KA, Korovessis C, Johnson AM, et al. Sexual behaviour in Britain: reported sexually transmitted infections and prevalent genital *Chlamydia trachomatis* infection. *Lancet* 2001;358:1851–4.

8 Miller WC, Ford CA, Morris M, et al. Prevalence of chlamydial and gonococcal infections among young adults in the United States. *JAMA* 2004;291:2229–36.

9 Holmes KK, Sparling PF, Stamm WE, et al. *Sexually Transmitted Diseases*, 4th edn. New York: McGraw-Hill, 2008.

10 Chapter 2.7 Sexually transmitted infections. In: Hawker J, Begg N, Blair I, et al. editors. *Communicable Disease Control Handbook*. 2nd edn. Oxford: Blackwell Publishing, 2007:38–41.

11 Department of Health. *National Chlamydia Screening Programme (NCSP) in England: Programme Overview; Core Requirements; Data Collection*, 2nd edn. London: Department of Health, 2004, http://www.dh.gov.uk/assetRoot/04/09/26/48/04092648.pdf (8 April 2011, date last accessed).

12 Australian Government. *Department of Health and Ageing. National Sexually Transmissible Infections Strategy*. Canberra: Commonwealth of Australia, 2005.

13 U.S.Preventive Services Task Force. Screening for Chlamydial Infection: U.S. Preventive Services Task Force Recommendation Statement. *Ann Intern Med* 2007;147:128–34.

14 Centers for Disease Control and Prevention. Sexually Transmitted Diseases Treatment Guidelines, 2010. In *MMWR* 2010;59:RR–12.

15 Low N, Cassell JA, Spencer B, et al. Technical Report. Review of Chlamydia Control Activities in EU Countries. Stockholm: European Centre for Disease Prevention and Control, 2008, Available from http://ecdc.europa.eu/en/publications/Publications/Forms/ECDC_DispForm.aspx?ID=235 (8 April 2011, date last accessed).

16 Ward H, Fredlund H, Gotz H, et al. ECDC Guidance. *Chlamydia control in Europe, June 2009. ISBN 978-92-9193-165-1*. Stockholm: European Centre for Disease Prevention and Control, 2009.

17 Low N. Screening programmes for chlamydial infection: when will we ever learn? *BMJ* 2007;334:725–8.

18 Gray JA. New concepts in screening. *Br J Gen Pract* 2004;54:292–8.

19 Smith R, editor. *Audit in Action*. London: BMJ publishers, 1992.

20 Johnson RE, Newhall WJ, Papp JR, et al. Screening tests to detect Chlamydia trachomatis and Neisseria gonorrhoeae infections–2002. *MMWR Recommendations Reports* 2002;51:1–38.

21 Control of Infectious Diseases Act: *SFS (Swedish Code of Law)*. Stockholm: Ministry of Health, 1988.

22 National Chlamydia Screening Programme. *NCSP: Five Years. The fifth annual report of the National Chlamydia Screening Programme 2007/8. 1*. London: Health Protection Agency, 2008.

23 van den Broek IVF, Hoebe CJPA, van Bergen JEAM, et al. Evaluation design of a systematic, selective, internet-based, Chlamydia Screening Implementation in the Netherlands, 2008–2010: implications of first results for the analysis. *BMC Infect Dis* 2010;10:89.

24 Low N, Broutet N, Adu-Sarkodie Y, et al. Global control of sexually transmitted infections. *Lancet* 2006;368:2001–16.

25 Oakeshott P, Kerry S, Aghaizu A, et al. Randomised controlled trial of screening for Chlamydia trachomatis to prevent pelvic inflammatory disease: the POPI (prevention of pelvic infection) trial. *BMJ* 2010;340:c1642.

26 Ostergaard L, Andersen B, Moller JK, Olesen F. Home sampling versus conventional swab sampling for screening of chlamydia trachomatis in women: a cluster-randomized 1-year follow-up study. *Clin Infect Dis* 2000;31:951–7.

27 Scholes D, Stergachis A, Heidrich FE, et al. Prevention of pelvic inflammatory disease by screening for cervical chlamydial infection. *N Engl J Med* 1996;334:1362–6.

28 Low N, Bender N, Nartey L, et al. Effectiveness of chlamydia screening: systematic review. *Int J Epidemiol* 2009;38:435–448.

29 Raffle A, Gray M. *Screening: Evidence and practice*. Oxford: Oxford University Press, 2007.

30 National Audit Office. Department of Health. Young people's sexual health: the National Chlamydia Screening Programme. Report by the Comptroller and Auditor General. HC 963 Session 2008-2009. London: The Stationery Office, 2009: 12–11. London, The Stationery Office.

31 Low N, Hocking J. The POPI trial: what does it mean for chlamydia control now? *Sex Transm Infect* 2010;86:158–9.

32 Holland WW, Stewart S, Masseria C. *Policy Brief: Screening in Europe*. Copenhagen: European Observatory on Health Systems and Policies, 2006.

33 Kamwendo F, Forslin L, Bodin L, Danielsson D. Programmes to reduce pelvic inflammatory disease–the Swedish experience. *Lancet* 1998;351(Suppl 3):25–8.

34 Ripa T. Epidemiologic control of genital Chlamydia trachomatis infections. *Scand J Infect Dis Suppl* 1990;69:157–67.

35 Catchpole M, Robinson A, Temple A. Chlamydia screening in the United Kingdom. *Sex Transm Infect* 2003;79:3–4.

36 UK National Screening Committee. Programme appraisal criteria. Criteria for appraising the viability, effectiveness and appropriateness of a screening programme. http://www.screening.nhs.uk/criteria (8 April 2011, date last accessed).