SYPHILIS

The characterisation of a recent syphilis outbreak in Sheffield, UK, and an evaluation of contact tracing as a method of control

Selena Singh, Gill Bell, Martin Talbot

Sex Transm Infect 2007;**83**:193–199. doi: 10.1136/sti.2006.022145

See end of article for authors' affiliations

Correspondence to: Dr M Talbot, The Medical School, University of Sheffield, Beech Hill Road, Sheffield 10, UK; martin.talbot@sth.nhs.uk

Accepted 14 November 2006
Published Online First
6 December 2006

Objective: To explore the factors around and the success of contact-tracing in a recent major outbreak of infectious syphilis in Sheffield, and to evaluate the effectiveness of it, our hitherto standard strategy of control.

Method: Retrospective chart review

Results: Over a period of 18 months, an outbreak of 21 cases was, on closer inspection, the result of several, discrete "micro" outbreaks in different groups. Two major patterns emerged, a relatively straightforward and more accessible cluster in heterosexual persons (a "spread" network), and more sporadic, "starburst" networks in men who have sex with men.

Conclusion: Our traditional method of control, contact-tracing, was seen to be most effective in the spread network in heterosexuals. In the face of an apparent outbreak, clinicians should explore the nature and parameters of their local epidemic and engage a mixture of control methods. These may include, but not exclusively so, contact-tracing to interrupt transmission by case-finding and by treatment.

The American Public Health Association defines an outbreak as an "... increase above the expected number of persons with a communicable disease ...".¹ One such outbreak of infectious syphilis in Sheffield (n = 516 000) (fig 1) has paralleled the recent increase in the identification of infectious syphilis in the British Isles.^{2–5} and we have explored the utility of our traditional control method, contact-tracing or partner notification, in our control attempts. These increases have reflected the worldwide situation, where the re-emergence of the disease after many years of apparent control is associated with sociomedical factors such as urbanisation, poverty and major political transitions.⁶

We have discussed earlier how public health strategies have been engaged to control local, national and international outbreaks, from labour-intense and individualised contact-tracing (or partner notification), to social network analysis, cluster-testing, population and targeted screening; even mass treatment.⁶ Different strategies in local situations are generally unproven: one method may be as effective as any other: controlled trials are impossible. Our facility uses the traditional control method of contact-tracing, which aims to break the chain of transmission of infection by identifying, counselling and testing sexual partners of individuals with sexually transmitted infections (STI). All patients with STI are interviewed by a health adviser according to the national guidelines.⁷ Patients are offered the choice of informing partners themselves (patient referral), or supplying details for a health adviser to inform the partner, without their identity being disclosed (provider referral); patients intending to inform their own partners may agree to health adviser intervention if the partner has not presented within an agreed time (conditional referral). To prevent future infection, patients are offered risk-reduction counselling and free condoms. The recommended review periods used were 3 months for primary syphilis, 2 years for secondary syphilis and for early latent.⁸ Cooperation with partner notification is voluntary in the UK: there is no statutory requirement to name partners, or to attend for treatment if notified of exposure.

Partner notification has been put to much effective use in Sheffield in outbreaks of gonorrhoea and chlamydial infection,⁹ yet we have seen that many kinds of individual and situational dynamics can impair best contact-tracing efforts. We were not certain that this approach was optimal in infectious syphilis. Thus, syphilis outbreaks may demand new strategies of control. The traditional approach seems to work well at controlling outbreaks in persons whose sexual preference is heterosexual, but has not been as effective in controlling outbreaks in men who have sex with men (MSM).² Other approaches have been used in that situation, including offering screening in venues, such as saunas, clubs or gay "bath houses", where sexual partners are met.^{4–6} These venues may also be used to advertise the outbreak, and advise people where to go for testing. The internet may also be used.⁴

Until recently, the incidence of syphilis in Sheffield has been low (fig 1). Of late, however, we have seen what at first sight seemed to be an "outbreak". Some authors have suggested that alternative strategies for control are best tailored to the phase of the local outbreak,¹⁰ for example, in the developing outbreak compared with the established one. In this light, the present work critically explores this putative outbreak and considers whether our strategy of contact-tracing was the most appropriate.

METHODS

Numbers and case reports were taken from computer-generated data held in the Department of genitourinary medicine (GU med) at the Royal Hallamshire Hospital, the only facility in the city that treats infectious syphilis. These data are normally generated to fulfil the statutory obligation of UK STI facilities (departments of GU med) to submit disease incidence figures to the Department of Health using the quarterly and annual "KC60" returns. We triangulated patient-referential incidence data by parallel computer-held records used by the contact

Abbreviations: MSM, men who have sex with men; STI, sexually transmitted infections

Figure 1 Incidence of syphilis in Sheffield. Presumed heterosexual and homosexual transmission.

tracers (health advisers; epidemiologists). These records reference demographic, sexual activity and sexual preference data, and may be cross-referenced to the numbers, and therefore contact-tracer records and clinical charts, of sexual contacts. We started to suspect an outbreak from our standard monthly incidence review and also the within-clinic sense that many of these cases were linked. At this point, it is our usual practice to start mapping cases as shown below. Case notes including partner notification records were reviewed for heterosexual cases of syphilis from the 12 months after the first case of locally acquired infection in October 2004. Homosexual cases were reviewed for 12 months from January 2004. There were no cases among bisexual men. Health advisers, who are responsible for partner notification, interviewed all patients with infectious syphilis during the study period: none refused to take part.

Data recorded for each partner (where available) included name, age/date of birth, address, telephone number, dates of first and last sexual contact, relationship type (regular, ex, casual) type of sex (oral, vaginal, anal), condom use, where met (if casual partner), plan agreed (patient, provider or conditional referral) at each interview and outcome (partner diagnosis/date; “untraced” or “informed but failed to attend”). All interviews and data recording were undertaken by health advisers having a mean of 10 years experience. Duration of interviews were not recorded, but are estimated to average 15 min.

Transmission networks constructed at the time from partner notification data were reviewed and updated. Partner notification processes and outcomes were analysed.

RESULTS

Outbreak statistics

Compared with the 7 years 1996–2002, during which a mean of 2.6 cases/year of infectious syphilis were seen, the 3 years 2003–5 saw 13, 15 and 16 cases/year respectively (Poisson CI (95%) 12.51–16.88 for the 3 years. $p < 0.05$ for each year) (Simple Interactive Statistical Analysis (SISA), quantitative skills). During this time, there were no significant changes in the population served by the Sheffield department, nor in diagnostic and laboratory test methods.

Demographics

Data for heterosexual syphilis showed one large network of 15 connected individuals (fig 2), and two smaller ones each of four individuals. Of the 23 individuals, 10 had 11 cases of syphilis, six contacts tested negative and six were untraced. Of the 11 cases, (three women,), six were primary, four were secondary and one was early latent. Networks for MSM (fig 3 and fig 4) show 34 individuals, of whom ten had infectious syphilis (five

Figure 2 Sexual network diagram of the heterosexual syphilis “outbreak” in Sheffield.

Figure 3 Sexual network diagram of linked MSM patients in the syphilis "outbreak" in Sheffield.

primary, four secondary and one early latent), eight were uninfected, one was notified but failed to attend and 16 were untraced.

All three female heterosexual cases were white, British with an average age of 24 years. Two had concurrent STI (trichomonas and/or Chlamydia) and one was a former commercial sex worker (CSW). Male heterosexual cases showed a higher age (average 30 years; range 22–44 years) and greater ethnic diversity (a group of four white patients; three black patients; one Asian: all British). Four had concurrent STI (Chlamydia and/or primary herpes).

Of the MSM cases, average age was 34 years (range 21–55 years) and 9/10 were white British. Five had a concurrent STI diagnosed (2 gonorrhoea; 2 chlamydia; 1 non-specific urethritis) and one was previously known HIV positive.

All cases (heterosexual and MSM) were local residents and none gave a history of intravenous drug use. Most heterosexual cases (9/11) lived in areas of social deprivation compared with 2/7 MSM cases. Deprivation was determined by the proportion of postcodes below the 20th centile on the national Index of

Multiple Deprivation, Super Output Area Levels (<http://www.communities.gov.uk>) (Sheffield has 29% population falling below the 20th centile).

Partner notification outcomes

Table 1 summarises case episodes using the traditional multiple counting system⁷. Episodes are counted rather than individuals: one individual may be counted several times as a case and contact(s) (appendix 1, table A; appendix 2, table B). The large heterosexual network (fig 2) shows the key role played in transmission by case 3, who is directly or indirectly linked to the six other cases. Most of her contacts were one-night stands—including one client from occasional escort work. The other three partnerships involved regular sex over a 2-month or 3-month period. There was a high level of concurrency: during September 2004, she was sexually active with two regular and three casual partners.

Transmission dynamics for MSM are less clear because most contacts (16/25; 64%) remained untraced. Of these, 88% (14/16) were from outside Sheffield—eight from elsewhere in the

Figure 4 Sexual network diagrams for unlinked MSM patients in the syphilis “outbreak” in Sheffield.

UK and seven from abroad. Most UK contacts were met over the internet, in telephone chat rooms, or in gay venues in cities known to have high rates of syphilis among MSM.

Partner notification interviews

A review of heterosexual case 3’s partner notification records shows the painstaking process required to uncover and trace those at risk. On her first interview she named two people (contacts 5 and 6), both of whom she said she would inform herself. During a second interview 3 days later, she had not

been able to notify them, so agreed to provider referral; she supplied details for contact 5, and promised to bring a phone number for contact 6; she also named a third partner (contact 7), who was untraceable. During a third interview 4 days later with a different health adviser, she named a fourth partner (contact 8) who she said she would inform herself. Attempts to interview her again were unsuccessful. She was later named by two patients with syphilis (cases 4 and 7), whom she had not named or informed. We were not able to link them to her straight away because they only knew her by an alias; eventually contact 5 confirmed she used both names. She is also probably linked to case 1, who described an unnamed casual partner he met in the club where she met other contacts; however, the description he gave did not match, so it is possible there was another untraced infected female.

Patient or provider referral?

Provider referral was preferred to patient referral for the majority (8/11) of sought heterosexual contacts (ie, those who had not already attended and were believed to be traceable). Of the eight tested contacts who attended following notification, (contacts 4, 5, 12, 14, 15, 16, 19, 26), seven had been informed by a health adviser. Four of the eight provider referrals were agreed at follow-up interview. Time between index and contact test ranged from 8–72 days (median 30).

Patient referral was preferred by MSM for 11/15 (73%) of sought contacts, although provider referral was more likely to lead to contact attendance: 6/11 (55%) of patient referrals attended, compared with 3/4 (75%) provider referrals.

DISCUSSION

While we have not seen as extensive an outbreak as seen recently in Dublin, for example, the increase in incidence which we saw in 18 months was unusual. Our “outbreak” seems to have been of a pattern intermediate between the large MSM outbreaks in Brighton and Manchester and the purely heterosexual one seen in the Fens.^{2–5}

The heterosexual outbreak in Sheffield seems to have been a “spread network”.¹⁰ A majority of the contacts were traced and tested, and since the end of 2004, no new infected patients were added to the network. Thus, a good measure of control was effected by partner notification. The MSM outbreak was harder to classify, since it was mostly comprised of sporadic cases probably acquired outside of Sheffield. Some of our cases showed a “starburst” pattern.¹¹ It may be that these cases form part of a larger maintenance, or dendritic,¹¹ network which extends over other communities, including the internet, where MSM from Sheffield meet partners. That infection persists in such networks is in part due to the inadequacy of partner notification when there are large numbers of untraceable contacts.

The higher proportion of linked cases in the heterosexual outbreak shows greater success with contact-tracing for this population than for MSM, who more frequently named casual untraceable partners from outside Sheffield or abroad, and were less receptive to provider referral. Standard contact-tracing methods alone may not be effective for such a situation. Having said that, the identification, diagnosis, treatment and therefore isolation of one infected individual removes them from the infection pool.

A review of partner notification records of heterosexual case 3 (the “night-club” patient) reveals the painstaking process required to uncover and trace those at risk. Multiple interviews were necessary to acquire data of several contacts and illustrates the value of repeating partner notification interviews to uncover contacts not disclosed initially: overall 25 interviews were conducted with the ten heterosexual cases, (average 2.5;

Table 1 Summary of partner notification for syphilis cases in Sheffield 2004–5

	Heterosexual	Homosexual
Total cases	11	10
Total contacts	26	28
Total contacts verified tested	20 (77%)	11 (39%)
Total contacts with syphilis	14 (70%)	4 (36%)
Total cases linked to another case	10 (91%)	4 (36%)
Total contacts verified tested per case within 90 days of index diagnosis	1.81	1

“Cases” = all episodes of syphilis diagnosed by Sheffield genitourinary medicine, including those who present as contacts of known cases. Patients with more than one episode counted more than once. Contacts diagnosed positive elsewhere not included as cases.

“Contacts” = all contact episodes: individuals named more than once are counted more than once.

range 1–4). The importance of cross-referencing cases to build a more complete partner/risk history is also highlighted.

Repeating partner notification interviews increases the proportion of provider referral agreements, because it gives patients who have initially opted for patient referral a chance to change their mind, and/or to bring contact information for provider referral. This tendency to switch from patient to provider referral, noted elsewhere,¹² illustrates the difficulty patients may have in notifying partners themselves, and the importance of health adviser support through repeat interviews.

Strategies other than contact-tracing have been developed in areas where the incidence of syphilis has dramatically increased.^{10–11} An outbreak in Dublin between 1999 and 2001 has led to an active educational campaign promoting sexual health screening.⁴ Information on syphilis and on-site serological testing was made available in venues where people met their sexual partners. Advertisements were placed on popular internet sites and in gay men's magazines. Other areas with high rates of syphilis have used strategies similar to these. In British Columbia, an area which sees a high incidence of syphilis associated with commercial sex workers, a social network approach was used in addition to standard contact-tracing.¹¹ "Street nurses" were sent to popular venues where people met their partners, to conduct interviews and offer testing. They also arranged follow-up and treatment outside of the clinics. This resulted in a significantly increased proportion of cases identified by the street nurses, and increased the percentage of cases linked to a previous case.

Some of these strategies could have been put into action in Sheffield to help reduce the number of untraceable patients in the heterosexual "outbreak". As most of the patients who were involved met their partners in a particular nightclub, information about syphilis and details of where to attend for testing could have been made available there. However, the outbreak was successfully controlled through partner notification so these strategies and other possible ones (eg, cluster or social network testing¹³) did not prove necessary. It was difficult to locate the MSM outbreak in Sheffield to any particular site and a large proportion of the contacts were from other areas of the UK and from abroad. In the event of a sustained outbreak, a multi-disciplinary approach is called for involving collaboration between public health, genitourinary medicine (GUM), microbiology and infectious diseases teams. It is also helpful to understand the phase of the outbreak, to allow tailored interventions to be formulated.¹⁰

Generally, we have been reassured by our analysis that our standard approach of partner notification has paid dividends. We managed to effect a measure of control in the heterosexual outbreak, and the corresponding one in MSM continues to be sporadic. However, with location-specific epidemiology and rapidly rising incidences of syphilis, local clinics should monitor their outbreaks and should be aware of new and innovative interventions, which might be adapted and implemented.^{13–14} These must be appropriate, accessible and acceptable to those at greatest risk. They may include the development of rapid, sensitive and specific diagnostic tests for syphilis, including a salivary assay for use in the field: significant numbers of our general clinic population decline venipuncture. This would allow screening to be more easily extended to venues such as saunas and clubs. Treatment regimes might be given as a single dose, although we have found that daily treatment with procaine penicillin—for example, is fruitful in adopting an iterative approach to contact tracing.

Key messages

- Clinics for the management of STI should be alert to the possibility of outbreaks of syphilis.
- They should be prepared to deal with the nature of an outbreak and the effectiveness of local control methods in place.
- Although they should be prepared to change and adapt to current circumstances, locally effective methods may be seen to be satisfactory and may be continued with success.

CONCLUSION

We have confirmed the experience of others that, in the face of an apparent outbreak, clinicians locally must explore the nature and parameters of the epidemic, and engage a mixture of control methods to interrupt infection spread by optimising case-finding and isolation by treatment, and by appropriate outreach initiatives.

Authors' affiliations

Selena Singh, The Medical School, University of Sheffield, Sheffield, UK
Gill Bell, Martin Talbot, Department of Genitourinary Medicine, Royal Hallamshire Hospital, Sheffield, UK

Competing interests: None.

Contributors: MT and GB had the original idea for the project and oversaw the work of SS who collected the original data. This was collated and enhanced by MT and GB. All contributed to writing the text.

REFERENCES

- 1 Heyman DL, ed. *Control of communicable diseases manual*. 18th edn. Washington DC: American Public Health Association, 2004.
- 2 Lacey HB, Higgins SP, Graham D. An outbreak of early syphilis: cases from North Manchester General Hospital. *Sex Transm Infect* 2001;**77**:311–13.
- 3 Palfreeman AJ, Moussa RA. Syphilis in the fens. *Sex Transm Infect* 2001;**77**:314–15.
- 4 Hopkins S, Lyons F, Mulcahy F, et al. The great pretender returns to Dublin, Ireland. *Sex Transm Infect*, 2001;**77**, 316–18.
- 5 Poulton M, Dean GL, Williams DI, et al. Surfing with spirochaetes: an ongoing syphilis outbreak in Brighton. *Sex Transm Infect* 2001;**77**:319–21.
- 6 Green T, Talbot MD, Morton RS. The control of syphilis, a contemporary problem: a historical perspective. *Sex Transm Infect* 2001;**77**:214–17.
- 7 Bell G. Partner notification audit, Manual for Sexual Health Advisers 2004 Ch6, pp 55–60, Society of Sexual Health Advisers, UK.
- 8 British Association for Sexual Health, HIV (BASHH). UK National Guidelines on the management of early syphilis. Revised 2005. <http://www.BASHH.org> (accessed 20 Dec 2006).
- 9 Bell G, Ward H, Day S, et al. Partner notification for gonorrhoea: a comparative study with a provincial and a metropolitan UK clinic. *Sex Transm Infect* 1998;**74**:409–14.
- 10 Low N. Phase specific strategies for the prevention, control, and elimination of sexually transmitted infections: case study in Lambeth, Southwark, and Lewisham, London: UK. *Sex Transm Infect*, 2002;**78**, i133–8.
- 11 Patrick DM, Rekart ML, Jolly A, et al. Heterosexual outbreak of infectious syphilis: epidemiological and ethnographic analysis and implications for control. *Sex Transm Infect*, 2002;**78**, i164–9.
- 12 Kahn RH, Peterman TA, Arno J, et al. Identifying likely syphilis transmitters: implications for control. *Sex Transm Dis* 2006;**33**:630–5.
- 13 Joseph A, Pallan M, Chandrami S, et al. Syphilis outbreak in Walsall: epidemiology and lessons for control. Poster presentation at 11th Annual Conference of the British HIV Association and the British Association of Sexual Health and HIV, Dublin: April, 2005.
- 14 Ponnudmy K, Gould P, Bignall CJ, et al. Syphilis in Nottingham predominantly a heterosexual disease. Poster presentation at 11th Annual Conference of the British Association of Sexual Health and HIV, Dublin: April, 2005.

Appendix 1 Partner notification outcomes and demographics for heterosexual cases of syphilis Sheffield GUM 1/10/2004 – 31/9/05

Case	Diagnosis	Contact	Diagnosis	Contact referred by
Case 1 Male	Primary syphilis Chlamydia Primary herpes	Contact 1 (Case 2)	Primary syphilis Chlamydia Trichomonas	Self Self
Case 2 Female	Primary syphilis Chlamydia Trichomonas	Contact 2 (Probably Case 3) Contact 3 (Case 1)	Primary syphilis Primary syphilis Chlamydia Primary herpes	Self Self Health adviser
Case 3 Female	Secondary syphilis	Contact 4 Contact 5 (Case 5)	Negative Primary syphilis	Health adviser Health adviser
Case 4 Male	Primary syphilis Primary herpes	Contact 6 Contact 7 (Case 9) Contact 8 Contact 9 (Case 4) Contact 10 (Case 7) Contact 11 (Case 3)	Secondary syphilis Primary syphilis Secondary syphilis Primary syphilis	Untraced Infectious diseases Untraced Self Self Self
Case 5 Male	Primary syphilis	Contact 12 Contact 13 (Case 3)	Negative Secondary syphilis	Health adviser Self
Case 6 Male	Primary syphilis	Contact 14 Contact 15 Contact 16	Negative Negative Negative	Health adviser Health adviser Index patient
Case 7 Male	Secondary syphilis	Contact 17 Contact 18 (Case 3)	Secondary syphilis	Untraced Self
Case 8 Female	Early latent syphilis. Chlamydia	Contact 19 Contact 20 (Case 10)	Negative Secondary syphilis	Health adviser Self
Case 9 Male	Secondary syphilis	Contact 21 Contact 22 Contact 23 (Case 3)	Secondary syphilis	Untraced Untraced (London) Infectious diseases unit
Case 10 Male	Secondary syphilis. Chlamydia	Contact 24 Contact 25 (Case 8)	Early latent syphilis	Untraced Self
Case 11 Male	Primary syphilis	Contact 26 Attending GUM elsewhere	Primary syphilis	Health adviser

Appendix 2 Partner notification outcomes and demographics cases of syphilis among MSM, Sheffield GUM 1/1/04 – 31/12/04

Case	Diagnoses	Contact	Contact diagnoses	Contact referred by
Case 1	Secondary syphilis	Contact 1		UK
		Contact 2		UK
		Contact 3		UK
		Contact 4		Abroad
		Contact 5		Abroad
Case 2	Primary syphilis. Gonorrhoea	Contact 6		Abroad
Known HIV+		Contact 7		Abroad
		Contact 8		UK
Case 3	Primary syphilis.	Contact 9	Negative	Index patient
		Contact 10	Negative	Index patient
		Contact 11	Negative	Index patient
		Contact 12	Negative	Index patient
		Contact 13		UK
		Contact 14		UK
		Contact 15		UK
		Contact 16		Abroad
Case 4	Secondary syphilis	Contact 17	Negative	Index patient
	Chlamydia	Contact 18		Abroad
Case 5	Secondary syphilis	Contact 19 (Case 7)	Primary syphilis	Index patient
		Non-specific urethritis		
Case 6	Primary syphilis	Contact 20 (Case 9)	Primary syphilis	Health adviser
		Contact 21	Negative	Health adviser
		Contact 22	Negative	Health adviser
Case 7	Primary syphilis. Non-specific urethritis	Contact 23 (Case 5)	Secondary Syphilis	Self
Case 8	Secondary syphilis. Chlamydia.	Contact 24		Informed by health adviser, but failed to attend
Case 9	Primary syphilis	Contact 25 (Case 6)	Primary syphilis	Self-referred
Case 10	Early latent syphilis. Gonorrhoea	Contact 26		UK
		Contact 27		UK
		Contact 28		UK

MSM, men having sex with men

Take advantage of BMJ Journals' remarkable catalogue of titles with Related Collections

No busy professional has time to browse through all pertinent journals to find relevant articles, but with Related Collections you no longer have to. Follow the "Related Collections" link from any article and use the "Show Collections from other Journals" to expand your search across all BMJ Journals. Or simply follow the "Browse by topic" link on the home page. By setting up your own collections and receiving email alerts every time an article is added to your chosen area, you can build up your own significant body of knowledge.