Public Health England

Consultation Report:

Routine offer of re-test to young adults testing positive for chlamydia

Consultation findings and evidence summary

August 2013

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In addition to this report, an NCSP position statement on re-testing of positive cases, and an abbreviated evidence summary, are also available on the NCSP website here.

SUMMARY & KEY MESSAGES

Individuals who test positive for chlamydia are at increased risk of subsequently testing positive, compared to those who initially test negative (see Appendix). As such, between December 2012 and May 2013, the National Chlamydia Screening Programme (NCSP) carried out a consultation on whether policy should be updated to: *"All individuals who test positive for chlamydia to be offered repeat testing at three months after treatment completion."*

The consultation activities consisted of an expert workshop, a web-based consultation questionnaire for professionals and a focus group with young adults.

Overall, the consultation findings supported the recommendation of routinely re-testing of all young adults who test positive for chlamydia, around three months after treatment, as part of the NCSP Standards[1] for case management.

Participants in the expert workshop group and respondents to the web-based consultation questionnaire were broadly supportive of a change in NCSP guidance, and felt strongly that this should be made part of the routine management of someone who tests positive for chlamydia, rather than introduced as a separate policy.

This audience also raised some important considerations for any future change in the NCSP standards. These included concerns about resource implications, the acceptability of re-testing, maintaining partner notification and health promotion activities, logistical considerations and whether an offer of a re-test would give the message that treatment was not effective. The provision of readily available guidance and information materials was seen as important way to deal with these concerns and potential unintended consequences.

[1] NCSP Standards (6th Edition). Available from: http://www.chlamydiascreening.nhs.uk/ps/resources/core-requirements/NCSP%20Standards%206th%20Edition_October%202012.pdf [Last accessed May 2013]

The young adults' consultation gathered feedback on the reasons for re-testing, the process and the terminology and communication they would prefer. The group agreed that re-testing was a good idea, but that the need for re-testing should be explained very clearly. The term 're-testing' was preferred to 'repeat testing', and the group felt that re-testing should always be presented as optional. Text messages and phone calls were popular preferred methods of receiving a reminder or an option for a re-test, but the group felt a variety of methods are needed. The language used in text messages or when offering a test should therefore be encouraging rather than prescriptive.

1. BACKGROUND

The NCSP offers opportunistic screening to all sexually active under 25-year olds in England, annually or on change of sexual partner. Management of individuals who test positive for chlamydia consists of antibiotic treatment, partner notification support and advice to promote sexual health. It is recommended that a 'test of cure' at around six weeks is offered to those considered particularly vulnerable (e.g. pregnant women), or those where poor treatment adherence or re-exposure is considered likely[2].

Routine re-testing of individuals who test positive for chlamydia is recommended in several countries (see Appendix), but has not been recommended by the NCSP up to this point. However, available evidence clearly describes that those who test positive for chlamydia are at increased risk of subsequently testing positive, compared to those who initially test negative (see Appendix). The NCSP is also aware that local practice varies in England.

Possible benefits of introducing routine re-testing could be identifying and treating any reinfections that may otherwise go untreated or be diagnosed late, thereby reducing the risk of onward transmission and of progression to reproductive complications. A secondary benefit could be enabling the detection, investigation and management of any possible cases of treatment failure, for whatever reason.

Potential unintended consequences could be increased stigma, increased costs and/or an inappropriate reliance on re-testing rather than delivering the interventions that help people stay chlamydia free after treatment. There is also very limited evidence on the acceptability of offering re-testing to young adults.

The NCSP therefore undertook a national consultation on whether current national policy should be updated to: *"All individuals who test positive for chlamydia to be offered repeat testing at three months after treatment completion."*

The aims of the consultation activities were to:

- Obtain a broad spectrum of views on whether to introduce the change set out above;
- Ensure the final decision reflects the perspectives of those commissioning, providing and participating in chlamydia screening and case/partner management;
- Ensure that, if the decision is taken to update policy, the change is implemented in a way that minimises any unintended and harmful consequences.

This report summarizing the findings from the three consultation activities undertaken:

1) A workshop of PHE, NCSP and external participants (held December 2012)
2) A web-based consultation questionnaire (March to April 2013)
3) Young adult consultation focus group (held May 2013).

[2] BASHH. 2006 UK National Guideline for the Management of Genital Tract Infection with Chlamydia trachomatis

2. EXPERT WORKSHOP

The NCSP convened an expert workshop in December to discuss the proposed change to the NCSP recommendations for re-testing following a positive chlamydia test. Participants included HPA (now PHE) and NCSP staff. External participants included clinicians, chlamydia screening providers, commissioners, academics, and a representative from the British Association of Sexual Health and HIV (BASHH).

The following evidence was presented or made available for review:

- Literature review summarising current evidence (see Appendix)
- Analysis of NCSP and genitourinary medicine (GUM) clinic data identifying existing patterns of re-testing within one year
- Summary findings from telephone interviews conducted with 19 service providers
- Four case studies, presented at the meeting.

2.1 Summary of expert workshop discussion

The expert group supported the introduction of a recommendation for routine re-testing of young adults who test positive for chlamydia around three months after treatment. Participants agreed that re-testing is aimed at detecting re-infections from new or existing sexual partners, not a test of cure. The rationale for retesting is to identify infections as soon as possible, to maximise the potential of interrupting the progression to sequelae, thus conferring a benefit to individuals.

However, it was felt the following issues should be considered when implementing any change:

- Re-testing should form part of standard recommendations for patient management, along with partner notification (rather than 'headline' screening policy).
- Given current proportions testing positive, and what is known about uptake of re-testing for different models, the impact on diagnosis rates is likely to be small, and thus may not have a major impact on diagnosis rates at a population level.

It was agreed that the recommended interval for re-testing after treatment should be around three months. A re-test at this time is likely to detect re-infections from both new and existing sexual partners, diagnose new infections early in the course of infection, and is also close enough to the initial diagnosis to be considered relevant to the patient, and could fit with other STI and contraception schedules. This interval is also consistent with international practice.

Following a positive re-test result, workshop participants felt that young adults should be recommended to re-test again at three months. A negative re-test result would be treated in the same way as a negative first test (i.e. reverting back to a recommendation of testing annually or on change of sexual partner, whichever is sooner).

The group agreed that the recommendation should apply to all young people who test positive, rather than just those considered to be 'complex'. Focusing on a complex group only was considered

to be potentially stigmatising, unnecessarily complex to implement and there was no evidence to consider that non-complex individuals would have a lower incidence of re-infection than those considered to be 'complex'.

It was agreed local areas would be responsible for deciding how any recommendations would be implemented, but that the NCSP would be able to provide some guidance regarding service delivery models or 'best practice'.

- Service delivery options include recommendations to patients, information leaflets, text message reminders and the use of home testing kits to increase uptake of retesting.
- The use of text messages was considered likely to be a low cost method of increasing rates of retesting at given intervals.
- The consent needed to contact people to invite them to retest may vary by the method of recall used. An opt-out approach was in general favoured by the group, but it was agreed that greater caution might be needed when sending out test kits than when just sending reminders.
- The NCSP should work with local areas to develop and refine best-practice guidance on acceptability, uptake and cost of different service delivery models.
- The NCSP standard patient information leaflet would need to be revised to include information on re-testing.

It was agreed that the NCSP should not initially aim to set specific standards for re-testing (e.g. uptake to be achieved), although this might be desirable in the future. However, it was agreed that the NCSP should develop standard evaluation templates for use by local areas, and to facilitate monitoring and evaluation of different models for implementing the change in policy.

- Existing data systems should be used for monitoring (CTAD and GUMCAD), acknowledging that these will not capture every re-test and will systematically under-estimate uptake. Further work will be needed to assess whether additional flags might be needed to improve identification of re-tests.
- The NCSP will work with local areas already implementing re-testing in order to develop and refine guidance on acceptability, cost and uptake of different service delivery models.
- Standard monitoring could include rates of repeat diagnosis, rates of retesting within two - four months and annual retesting rates.

2.1.1 POTENTIAL UNINTENDED / HARMFUL CONSEQUENCES

- Emphasising re-testing might inadvertently undermine prevention messages or increase feelings of stigma for those who test positive for chlamydia.
    - It was felt by the group that the messaging around retesting would be crucial in order to prevent inadvertently increasing sexual risk behaviours or stigma for those who test positive.
    - Acceptability of re-testing recommendations should be considered as part of any local implementation and evaluation.

- Could incur additional costs to providers.
    - Local areas should be advised that the cost of re-tests should not be disproportionate to index screens.
- Re-testing of positive cases might be emphasised over population screening, meaning those not previously diagnosed might not be identified and treated

- It was felt that framing re-testing as a case management policy, rather than an overall screening policy, would mitigate this, but that there would need to be careful communications to commissioners and providers to avoid this unintended consequence.
- Whilst we would expect higher rates of positivity in repeat tests of positive, the desired outcome would be low positivity (in an ideal world of perfect treatment compliance, PN and behaviour modification!)

2.1.2 OTHER POINTS DISCUSSED

There was some discussion around the current wording of the recommendation to re-test 'on change of sexual partner', as this could be interpreted as before during or after a new sexual partnership. It was agreed that this ambiguity was appropriate, given the variety of testing behaviours and that all testing around a change of sexual partnership was to be encouraged.

The group agreed that while re-testing after a positive diagnosis was important, retesting after a negative test (i.e. annually or on change of partner) remains important and may benefit from increased emphasis.

Enhanced care pathways for individuals who test positive at re-test may be appropriate, including motivational interviewing, enhanced partner notification and testing for other STI. These patients may need referral to a setting with a health adviser. This topic will require further consideration and development.

There was some discussion regarding recent evidence that treatment with Azithromycin (1g dose) may be <95% efficacious, rather than 95% efficacious as previously thought (Horner, STI 2011). As this was not the primary purpose of the meeting, this issue was not discussed in depth, and the evidence relating to this issue was not reviewed in full. However, it was generally agreed that there is not, at present, sufficient evidence of lower treatment efficacy to warrant changing practice around the choice of antimicrobial therapy, but that this should be closely monitored.

2.2 Planned next steps

It was agreed that the NCSP would prepare a consultation document in order to obtain input on the proposed change to the recommendation.

3. WEB CONSULTATION QUESTIONNAIRE

Between March and April 2013, a consultation questionnaire was made publically available on the NCSP website for completion. Representatives of professional organisations, and commissioners and providers of young adult sexual health services were invited to respond to the consultation, but the questionnaire was not limited to those who were specifically invited.

Respondents were asked to indicate whether they agreed or disagreed with a series of statements (Box 1), and to provide free text responses where appropriate. Free text responses were categorised into themes by two members of the NCSP team.

Box 1: Questions included on the consultation questionnaire

- Should national policy be updated to: all individuals who test positive for chlamydia to be offered repeat testing at three months after treatment completion?
- Do you think offering repeat testing to positive cases would be acceptable to young adults?
- Do you have any concerns about the repeat testing policy under consultation?
    - *If yes, please give reasons for your answer.*
- Would you be concerned if the NCSP policy on repeat testing of individuals who test positive for chlamydia is not changed?
    - *If yes, please give reasons for your answer.*
- Do you believe there would be any unintended consequences of this change of policy?
    - *If yes, please outline these, detailing any evidence/ experience related to your concerns.*
    - *If yes, do you think these are avoidable with good practice supported by guidance?*
- If national policy on repeat testing is changed, what specific guidance, tools and materials would be helpful to areas to support local implementation?

3.1 Results

107 responses were received from clinicians, managers and commissioners from the fields of chlamydia screening, sexual health and public health (Table 1).

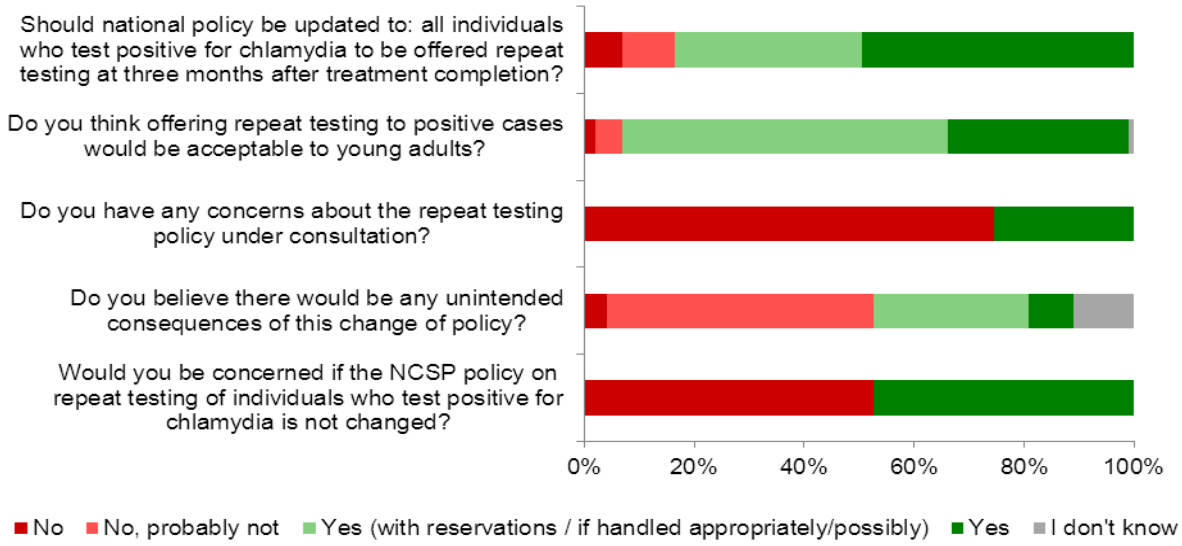
Table 1: Reported roles of respondents to web-consultation

Role	N	%
Chlamydia Screening coordinator/lead/nurse	21	20%
Commissioner	4	4%
Sexual health (clinician / manager)	19	18%
Public Health (clinician/manager)	6	6%
Other clinician/manager, or speciality not stated	11	10%
Other	11	10%
Not stated	35	33%

3.1.1 VIEWS ON NEED FOR CHANGE TO NCSP RE-TESTING POLICY

The majority of respondents supported a change to NCSP recommendations (83%) and thought that offering re- testing to positive cases would be acceptable to young adults (92%) (Figure 1).

Figure 1: Summary of responses to multiple choice questions (n=107)



Just under half (48%) of respondents stated that they would be concerned if the re-testing policy was *not* changed. Where additional detail was provided in the free-text section of this question, respondents felt that the evidence that demonstrated that those who have been positive before are at increased risk of re-infection warrants an update to the re-testing policy as without a change in policy, services might be missing an opportunity to detected re-infections and to identify a high risk group. Respondents to this question felt that services should be offered based on the best evidence.

In addition, some also commented that a form of re-testing had already been implemented locally and that it would be useful to have guidance to support this.

A smaller number of respondents commented that a change in policy:

- may help identify antimicrobial resistance,
- would be a cost efficient use of resources to focus resources on this high risk group,
- would assist in achieving Public Health Outcome Framework measures, and
- would help support treatment and PN follow up

3.1.2 CONCERNS RE: POLICY CHANGE AND UNINTENDED CONSEQUENCES

While the majority of respondents did not have concerns about the proposed change in policy, and did not think that there would be unintended consequences, a notable minority stated that they had concerns (25%) or agreed that there might be unintended consequences (36%). Additionally, 34% agreed with a change of national policy, but 'with reservations'.

For those who said they had concerns, or that there would be unintended consequences, an opportunity to provide further detail was provided in the free-text sections. Where concerns were raised (among both those who did and did not support a change in policy), these could be broadly categorised into five themes.

Some respondents were concerned that a change in the re-testing policy might:

- Increase provider workload and have resource/logistical implications;
- Stigmatise positive cases and potentially disempower young adults;
- Diminish the importance of prevention messages and/or partner notification;
- Give the impression that treatment is unreliable.

In addition, one respondent stated that the evidence base did not support a change in policy. Further detail and a summary of these comments are provided below, in order of frequency reported.

Resources and logistics

The most often cited concern or potential unintended consequence was that a change in policy would incur additional resource use and may present additional workload for services. Developing systems to flag and follow up patients that were eligible for re-testing was highlighted as a likely additional cost that might not be met within existing capacity.

Some specific queries were raised about the delivery of re-testing. These included concerns about whether it would be possible for all clients to be offered a re-test, how to ensure response to a re-testing invitation, and who would be responsible for delivering and monitoring a re-testing service, especially where results management was not done through a central chlamydia screening office, or where patients went across services. Frequent changes of contact details or address, and the need for standard protocols for the number of attempts made to contact someone were also raised as service considerations. Questions about the timing of the re-test were also recorded, with some requests that for flexibility in the window for re-testing.

One respondent suggested that non-automated recommendations to re-test would likely be forgotten, and that there didn't seem to be one way of offering re-testing that patients preferred (response received as an 'additional comment' from a service who has been running a pilot of re-testing).

Acceptability

The majority of respondents thought that offering re-testing to positive cases would be acceptable. However the handling of the offer appeared to be important, as 59% agreed that it would be acceptable, 'if handled appropriately' (Figure 1). Where issues around acceptability were cited in the free-text responses, respondents highlighted the potential for young adults to feel stigmatised or harassed, to increase anxiety or to disempower people with regard to their sexual health. Some respondents reported that young people already returned for re-testing when they thought they were at risk, and in relation to change of partner.

Re-testing of positive cases in the context of the screening and clinical care pathway

Several comments referred to the need for re-testing to be considered in the context of clinical care. Prevention messages were seen as being key components of care, and that re-testing would not be needed if they were being effectively delivered and acted upon. Respondents thought that it was important that re-testing be considered an additional part of screening, rather than an alternative to behaviour change, regular testing or to other prevention-related activities.

One respondent raised the potential for patients to be confused about how routine re-testing at 3 months related to recommendations about re-test on change of partner.

Communication about treatment efficacy

Some respondents felt that asking positive cases to be re-tested might give patients the impression that treatment is unreliable or not effective. Comments in this category suggested that it was important to clearly explain the reason for re- testing, and to introduce this early in the course of the screening/testing pathway.

3.1.3 REASONS FOR NOT SUPPORTING A RE-TESTING POLICY

17 (16%) respondents did not support a change in the repeat testing policy. The main reasons cited for this were:

- Is not a good use of resources and would increase burden on services;
- Would give the impression of perceived treatment failure;
- Would diminish the important of health promotion and prevention messages;
- Would change the focus of the NCSP from opportunistic screening to clinical management;
- Would disempower young people, and reduce their sense of individual responsibility. It would be too 'nannying'.

Less frequently mentioned were:

- Lack of evidence
- Stigmatisation of positive patients

3.1.4 REQUESTED IMPLEMENTATION GUIDANCE

Respondents were asked what guidance or tools would be useful to support implementation of an updated repeat testing policy, and several suggestions were made about what would be useful. Respondents were very supportive of the idea of tools and guidance, provided by the NCSP in a timely manner, in order to aid implementation and prevent duplication of effort. Responses, grouped into patient focused guidance and tools and guidance aimed at professionals, and details are provided below.

Patient-focused

Various types of communication aids were mentioned, such as leaflets, posters, online resources, telephone app, and a national campaign. The majority asked for patient information material that:

- Explains the need for re-testing;
- Highlights the importance of prevention of (re-)infection, and
- Introduces the concept of re-testing at the earliest opportunity in the screening pathway.

Professional-focused

The guidance, resources and tools that were suggested for professionals and programme areas to use were more extensive, and can be divided into a number of categories, as presented in Table 2.

In addition, one respondent suggested that NCSP to *"seriously consider National purchase of a texting service and its campaign material that we can utilise flexibly for local needs as this brings competitive options for the reminders and postal kits that may encourage better competition and pricing for services."*

Table 2: Requested guidance

Category of guidance	Details
Rationale (why)	• Clear information on why the change is needed • Evidence of the benefit
Policy (what)	The policy could include: • Clear guidance on the timing of the re-test • Put re- testing in context of Partner Notification, compliance of abstinence advice and other health issues including contraception • Guidance on how to deal with consent • Specific target for compliance • Role of patient choice
Guidance (how)	To include: • Case studies/examples of good practice • Examples of text messages, email text, letters, a strapline • BASHH guidance to be in line with this • Email updates • Flow chart / pathway • Best methods of recall • Audit tools and measurable audit outcomes (audits on the re-infection rates of first time positive clients) • Communication aids (see also under 'patient focused) • For professionals: online forum, e-learning • Cross sector working • Different audiences could be identified: local programme areas, commissioners and commissioning boards.
Resources/ logistics	• Additional resources (financial and other) • Centralised recall system possible coordinated by labs or HPA • IT support, ability to send reminder text when re-test is due

3.1.5 Pilot work

A small number of respondents suggested that the NCSP should pilot the re-testing policy by area in order to enable evaluation, with an economic analysis.

3.2 Conclusion

The majority of the respondents to this web-based consultation survey supported a change in NCSP policy to offer re-testing to positive cases around three months after treatment completion. While the majority of respondents were supportive of the policy, important concerns and potential for unintended consequences were raised during the consultation.

4. YOUNG ADULT CONSULTATION

In May 2013, a focus group was held with eight young adults (four male, four female) aged between 17 and 24. They all self-identified as being of White European, Black African/Caribbean or Middle Eastern ethnicity and all participants lived in London. The group was asked to consider a number of issues including:

- Their understanding of re-testing, why you would need to re-test how this should be explained, when this should be offered and the potential value of re-testing
- The timings and methods of communication they would prefer in being offered and reminded about a re-test, and their preference regarding terminology used.

4.1 Key findings

The group was relatively knowledgeable about chlamydia and nearly all of them had been offered a test in the past.

4.1.1. General attitudes towards re-testing

The group agreed that re-testing was a good idea, but felt that the need for re-testing needs to be clearly explained. The young adults felt the advice should highlight that if you are sexually active with more than one partner you have a greater chance of reinfection. (e.g. “It’s a simple message: if you have a lot of sexual partners you are likely to get infected again.”)

Some felt that offering re-testing could lead to continued risky behaviour; “People might think if they are going to be tested again soon why bother to be careful as you will be tested again in a couple of months”.

4.1.2 Timing of re-test

The group was asked about the gap between tests (they were given a range between four weeks to five months after the first test). The group felt that waiting three months was too long and that they would be less likely to take up the offer for a re-test than if it came back after two months.
The group felt that people should be told at the time of testing that if they test positive they were likely to become re-infected within a couple of months.

4.1.3 Preferred options for receiving a reminder or offer of a re-test

The group was asked about their preferred methods for receiving a reminder. They were asked to indicate their top three preferred options from:

- Face to face with a doctor, nurse, counselor etc.
- A text message
- A phone call
- Repeated reminders linked to a record
- Email reminder with a link to reorder a testing kit online
- Automatically have a re-test kit sent to your home.

The group said there should be a variety of methods employed to remind people about the re-test. Automatically receiving a test kit in the post was not popular. The group wanted to know where the kit would be sent, and that it would be packaged appropriately. The group suggested that it could be an option when you have your first test to opt in or out.

Texting and phone calls were most often selected as preferred options. Texting/SMS was very popular but some felt the message would need to be carefully worded. The group did not want the name of the infection included in the text, but felt the reminder should be straight forward. For example 'you are due for a re-test'. Phone calls were popular because they provide an opportunity to talk to someone and have questions answered.

Face to face contact and email were the next most popular reminder method. Face to face contact was highly valued as it provides an authoritative source of advice and information. Email linked to social media was considered to be a good reminder but also a method for raising awareness of infections and sexual health.

Going to a GP was one of the least popular options but some felt it was helpful to have access via their doctor if necessary. Some felt it depended on how often you went to see your GP, and might only be relevant if you have a chronic condition which requires regular visits to the GP.

4.1.4 Choice of language

The group emphasised that the choice of language was very important when discussing re-testing. Specifically:

- The group preferred the wording 're-testing' to 'repeat' testing as the latter suggested they could be tested again many times over
- Language should be carefully selected to avoid coercion or suggest that re-testing is automatic. The language should be encouraging not forceful. For example wording such as 'we recommend you have another test', 'we recommend you to retest in a couple of months' and 'how would you like to receive the results?' rather than 'you should retest' were strongly preferred.

APPENDIX

Repeat testing for *Chlamydia trachomatis*: Evidence summary
Sarah Woodhall

This briefing paper was compiled for the Health Protection Agency workshop on repeat testing, held on the 20 December 2012

1. Aim and scope of the review

To provide a summary of the evidence relating to the following questions:

- Should the NCSP policy on repeat testing for chlamydia be revised?
- If so, what delivery model(s) should be recommended?
- What further work is needed to inform decision-making or support policy change?

It is beyond the scope of this review to provide a detailed summary of evidence relating to efficacy of partner notification or interventions to reduce the risk of re-infection. However as there is considerable evidence to suggest that young people who are diagnosed with chlamydia are at subsequent risk of re-infection (see section 2), it should not be forgotten that re-infection is not inevitable, it is preventable.

National guidelines emphasise the importance of identifying, testing and treating (where appropriate) current and recent sexual partners of people diagnosed with chlamydia[1;2]. Guidance from the National Institute of Clinical Excellence recommend that people at high risk of infection are offered one to one structured discussions with appropriately trained health professionals[3].

The possibility of persistent infection after treatment with azithromycin has recently received some attention[4;5]. While treatment failure rates are relevant for the effectiveness of repeat testing, a detailed review of this evidence is beyond the scope of this review, and is not discussed in any further detail.

2. Risk of re-infection following a positive test

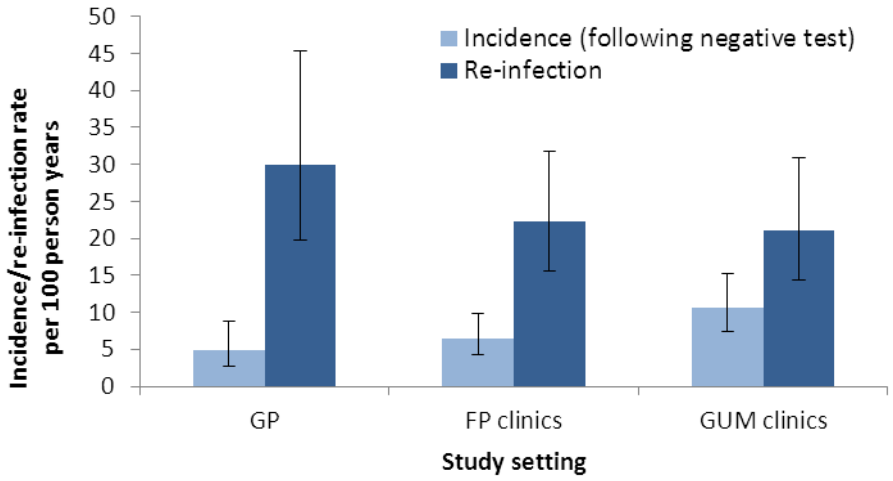
Key messages
- Young people who test positive for chlamydia are at higher risk of subsequently testing positive for chlamydia.
- High rates of re-infection have been consistently reported in several settings

Several studies have reported an increase in the risk of testing positive at subsequent tests, following a positive. Studies can be broadly categorised as either prospective or passive follow up. Studies with passive follow up are limited as it is feasible and likely that the risk of infection among those tested will be different to the risk among those who were not re-tested. This bias will be greater in studies with passive follow up, although studies with active follow up will still be subject to this bias in the absence of 100% participation rates at follow up.

The most comprehensive source of information on risk of re-infection in England comes from a study conducted at the outset of the NCSP in 2002/03. In a prospective cohort study of 16 to 24 year old women tested in GP, family planning or GUM clinics, participants were tested at baseline and 6

monthly intervals, with an additional test at 3 months after a positive test. Re-infection rates were substantially higher than rates of incident infections (following a negative test) in all three settings (Figure 2). Re-infection rates among those who participated in follow up ranged from 21 per 100 person years in GUM clinic settings to 30 per 100 person years for those recruited through GPs[6].

Figure 2: Reported incidence and re-infection rates among 16 to 24 year old women, in a study with active follow up



Three other recent studies with prospective follow up in other countries have demonstrated higher rates of infection following a positive test compared to a negative test. Walker et al recruited 16 to 25 year old women from GP, sexual health and family planning clinics in Australia. Women were tested for chlamydia every 6 months, with an additional test at 3 months for those who test positive. The incidence of infection was 4.4 per 100 person years (95%CI 3.3 to 5.9) following a negative test, compared to 22.3 per 100 person years (95%CI 13.2 to 37.6) following a positive test[7]. Batteiger *et al* recruited 14 to 17 year old females in a cohort study with 3 monthly tests for chlamydia. Infections occurred at some point during the follow up period in 78% of those with infections at baseline compared to 52% of those without an infection at baseline[8]. As part of the Chlamydia Screening Implementation programme in the Netherlands, postal sampling kits were sent to participants six months after an initial positive test. Among those who returned a sample, 8.8% tested positive, compared to 4.1% at first test[9].

While the findings from these studies show a consistent pattern of increased risk of infection among those who initially test positive, it should be noted that the studies by Lamontagne *et al* and Walker *et al*, a different follow up schedule was used for those with an initial positive compared to an initial negative. It is therefore feasible that those who tested negative had infections that went undetected during the longer follow up period, and then resolved spontaneously. So it is possible that the rate of incident infection after a negative baseline test has been underestimated. It is also possible that rates of re-infection were different among those who did not return for follow up, thus the rate of infection following a positive test may have been overestimated.

The findings from the study by Lamontagne *et al* are consistent with a recent analysis of routinely collected data from 15 to 24 year olds tested through the NCSP or GUM clinics in England in 2010. In this analysis, the proportion testing positive at repeat test was substantially higher among those who had an initial positive test, compared to those with an initial negative test. In GUM clinics, 8.2% of repeat tests were positive following a negative test compared to 17.0% after an initial positive; in NCSP tests, 4.8% of repeat tests were positive after an initial negative, compared to 12.5% after an initial positive test[10]. These findings are consistent with analysis of data from one region in England (Cornwall), where tests from all settings were available in a single dataset. Between 2003 and 2009 7.2% of repeat tests were positive among 12 to 25 year olds initially testing negative compared with

19.4% of those who were initially positive[11]. A similar analysis of routinely available data from an STD clinic in the USA also found a higher rate of re-infection (23.6 per 100 person years, 95%CI 18.9 to 28.2) than incidence after a negative test (10.0 per 100 person years, 95%CI 8.9 to 11.2), among a cohort of STD clinic attendees who were tested more than once in a 2.5 year period[12].

As well as the rates of re-infection reported in the studies in section 2, several studies have reported high rates of re-infection from studies using both active and passive follow up. A systematic review of repeat infection rates among women reported a median of 14% of women re-infected at repeat test, based on a range of follow up times and study designs[13]. A separate review found a median of 11% of men infected at repeat test, with study estimates ranging between 10% and 18%[14]. It is important to note that study designs and follow up times have varied considerably, making direct comparisons between studies impractical.

3. Risk of re-infection in the context of partner notification

Key message
- Rates of re-infection could likely be reduced with effective partner notification - However high rates of re-infection have been observed even in studies with high levels of partner notification

Incomplete or inadequate treatment of existing sexual partners is one potential source of re-infection among people who are diagnosed with chlamydia and receive effective treatment. The extent to which re-infection rates vary by partner notification rates has not been explored in detail. However there is evidence to suggest that rates of re-infection are high even in the presence of high levels of partner notification.

In their cohort study with repeated chlamydia testing of 14 to 17 year old women, Batteiger *et al* used a combination of genotyping on the repeated samples and reported coitus between tests to identify possible reasons for repeat diagnoses. Partner notification had been recommended, but the achieved rates of partner treatment were not known. An estimated 65% of re-infections were likely to be associated with infection from a different partner, and 17% were likely to be associated with repeat exposure to the same partner[8].

In the study by Lamontagne *et al,* rates of re-infection remained higher than incidence rates following a negative test, even when analyses were restricted to individuals where all reported partners were treated. For example for those recruited from GP settings, the rate of incident infections after a negative test was 4.9 per 100 person years (95%CI 2.7 to 8.8), compared to 22.3 per 100 person years (95%CI 12.3 to 40.1) for those with all partners treated, and 53.2 per 100 person years (95%CI 28.6 to 98.8) for those with <100% of partners treated[6].

Studies of interventions aimed at increasing rates of partner notification have reported substantial rates of re-infection, even in the intervention groups, suggesting that the risk of re-infection remains high even in the presence of robust partner notification. For example a study of patient-delivered partner therapy among 14 to 34 year old women in the US found that 12% of women in the intervention arm were re-infected within four months. Re-infection rates were not reported separately for those with and without partner treatment, but 85% of women in the intervention arm reported providing antibiotics to their partner(s)[15]. In a study by Cameron *et al* in Scotland, two interventions were compared to self referral: partners of index cases were sent postal sampling kits and index cases were provided with antibiotics for their partner(s). Substantial rates of re-infection were seen in both intervention groups (22% of those in the postal kits group; 13% of those in the patient-delivered partner therapy group)[16].

4. Impact of repeat testing on progression to sequelae, chlamydia incidence and prevalence

Key message
- Data from observational studies and mathematical models suggest that repeat chlamydia infections are associated with an increased risk of PID and long-term reproductive sequelae. - Evidence from one mathematical modelling study suggests that re-infections within sexual partnerships are likely to be important in maintaining levels of chlamydia prevalence - There is limited evidence on the potential impact of increasing repeat testing on the incidence or prevalence of chlamydia or on the development of chlamydia-related sequelae

4.1 Impact on chlamydia-related sequeale

Several observational studies have demonstrated an association between repeated chlamydia diagnoses and increased risk of PID and long-term reproductive sequelae[17]. These studies are subject to limitations. Firstly, studies may be subject to ascertainment bias as a clinician may be more likely to diagnose a woman with PID if they have a known history of chlamydia. Secondly, distinguishing between first and repeat infections, or establishing the number of previous infections with any accuracy is also difficult, and remains a limitation of available observational studies. Thirdly, it is unclear whether the risk of sequelae is cumulative with each successive infection, or whether the risk associated with a repeat infection differs to the risk associated with a first infection[17;18].

Despite these limitations, it is reasonable to assume that prevention or treatment of a repeat infection is likely to be at least as beneficial as preventing or treating a first infection at an individual level. Data from the Prevention of Pelvic Inflammation (POPI) study showed that treatment of asymptomatic chlamydia reduced the risk of being diagnosed with PID within one year (relative risk: 0.17, 95%CI 0.03 to 1.01)[19].

The potential added benefit of repeat testing sooner than one year after a positive diagnosis would depend partly on the point in a chlamydia infection at which damage occurs. If damage occurs very soon after initial infection, then regular asymptomatic screening and repeat testing is likely to have less impact than if damage occurs either throughout the course of infection, or at later in the infection.

Price et al have shown that existing published data are consistent with higher rates of PID being caused within the first 60 days following an infection, but also that the data are consistent with continuous risk of progression through the course of an infection (Price et al. In press, 2012). In a separate study, Herzog et al used data from the POPI trial to explore three different scenarios of progression to PID (progression at the start, end or throughout the course of the infection). The analysis found that either progression at a constant rate from a chlamydia infection to PID or at the end of the infection was compatible with the findings of the POPI trial[20], suggesting potential for asymptomatic screening (including repeat testing after a diagnosis) to prevent incidence of PID.

4.2 Impact on chlamydia incidence and prevalence

Evidence from mathematical modelling of available data from England suggests that increasing diagnoses can lead to a fall in prevalence of chlamydia[21]. It is unclear, however, whether diagnosing and treating a re-infection would have any greater or lesser benefit than treating a first infection. Heijne et al explored the impact of re-infection on transmission and prevalence by comparing the outputs from a mathematical model which allowed for re-infection within ongoing partnerships to

one that did not. The pair model predicted a weaker impact of screening when compared directly with a model that did not accommodate partnerships, thus re-infections are likely have an important role in ongoing transmission[22].

It would be reasonable to assume that re-infections may contribute disproportionately to ongoing transmission, as re-infections occur among those with higher rates of partner change. However further work would be needed to validate this hypothesis. Greater understanding of the natural history of infection would improve understanding about the potential benefit of chlamydia screening and repeat testing.

5. Time between treatment and repeat testing

Key message
- The optimum interval for repeat testing has not been established, but will depend on biological and logistical considerations about when a patient is most likely to become re-infected and when they are likely to accept an offer of a repeat test.

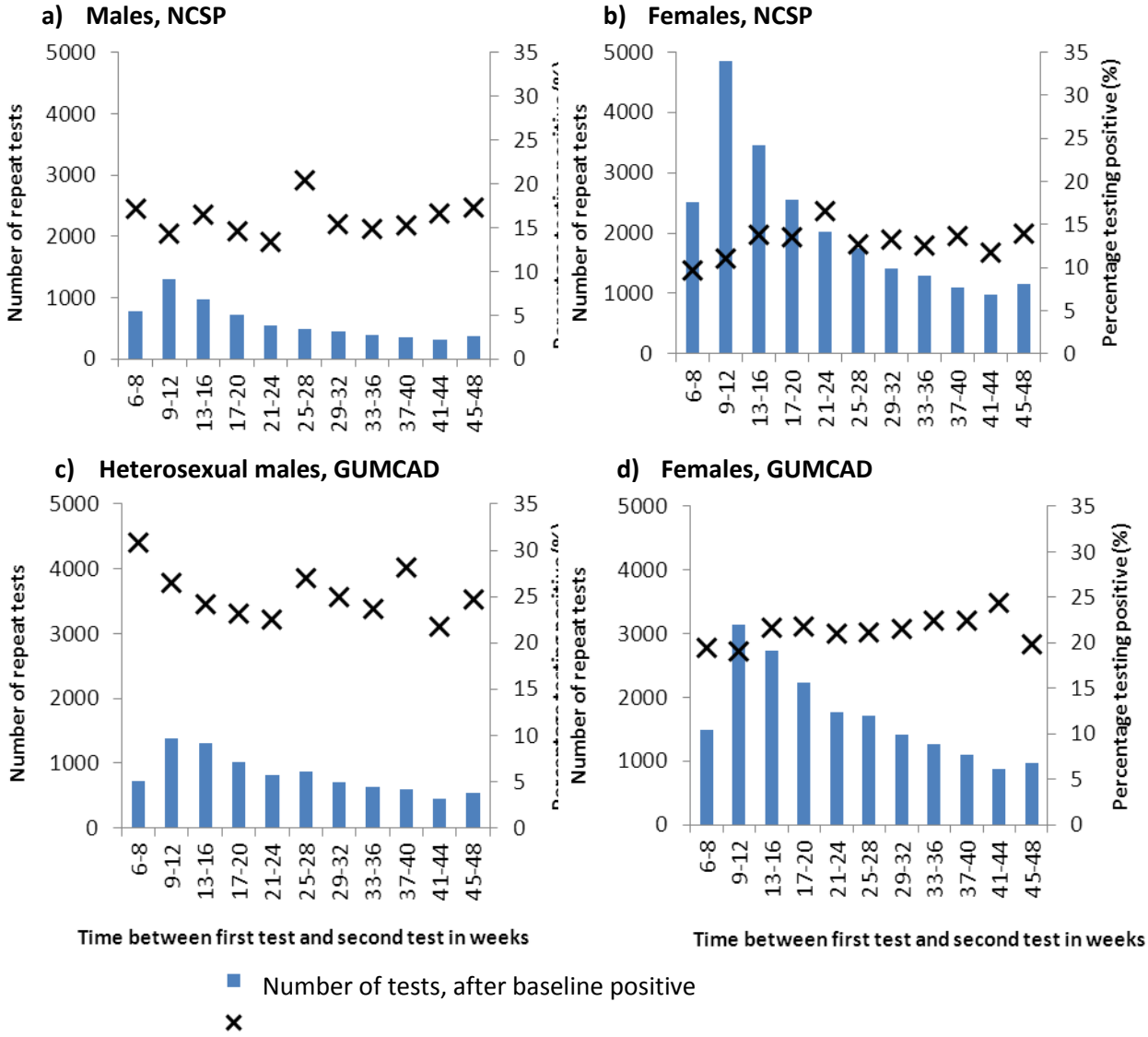
The optimum interval for repeat testing has not been established. The point at which most infections would be diagnosed depends on the duration of infection, rates of partner change, and the proportion of re-infections due to new rather than existing partners. Mathematical modelling using data from insurance claims in the US suggest that repeat infections peaked between 2 and 5 months after initial infection[23].

Analysis of NCSP and GUMCAD data shows that the test positivity at repeat test did not vary by time since diagnosis among 15 to 24 year olds in 2010 (Figure 3).

In a recent prospective study, 52 patients treated for chlamydia with 1g Azithromycin were tested for chlamydia at short intervals between 3 and 8 weeks after treatment. A high proportion of infections (42%) were found to be positive on at least one of the samples taken after 3 weeks; intermittent positive tests were common. Tests taken between 3 and 8 weeks after treatment may not therefore accurately reflect infection status. *[Note: this paragraph was included after the retesting workshop. Reference: Dukers-Muijrers et al; PLoS ONE 2012;7(3):e34108]*

The potential impact of repeat testing will also likely vary by the time of re-test. In terms of interrupting the progression from chlamydia to PID, the optimum interval for re-testing depends on the point during an infection at which PID occurs (section 4). In terms of interrupting transmission, if retesting occurs after re-infection, but before contact with a new sexual partner, the re-testing could potentially have a greater impact on transmission than if testing occurs after the infection has already been transmitted to a new partner.

Figure 3 (a to d): Number of repeat tests following a positive baseline result, and proportion testing positive at repeat test (15-24 year olds, by gender 2009-2011, NCSP and GUMCAD datasets)



Source: NCSP and GUMCAD. Data as at November 2012. Tests and diagnoses were de-duplicated to allow one testing episode within 6 weeks. Individuals could not be tracked between GUM clinics in the GUMCAD dataset, or between the GUMCAD and NCSP dataset. MSM were excluded from the GUMCAD analysis.

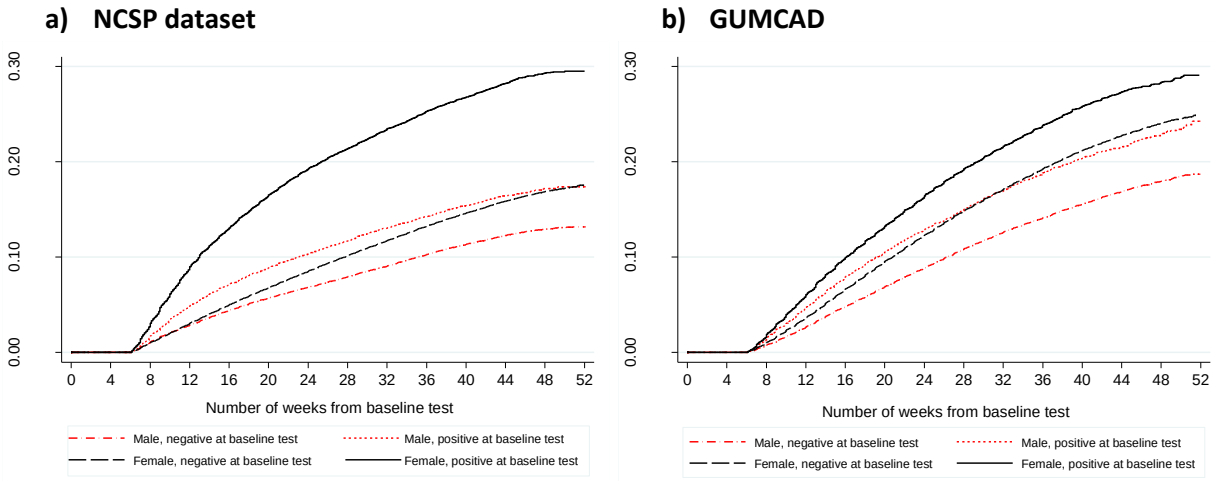
6. Current repeat testing rates in England

Key message
- Moderate rates of repeat testing already occur in England among young adults, although these are lower than might be expected if all young people were re-tested on change of sexual partner - The number of infections that would be diagnosed and treated, over and above those identified via existing testing patterns has not been demonstrated in practice - The number of additional infections that could be identified is likely to vary by the method of encouraging repeat testing. - Screening annually or on change of partner for those testing negative is important given that those testing negative remain at risk of future infection.

Young people who have recently changed sexual partner are known to be at increased risk of infection[24]. The NCSP therefore recommends that young adults are encouraged to have a chlamydia test with every change of sexual partner.

Moderate rates of repeat testing following a positive test already occur in England among young adults. In a recent analysis of NCSP and GUMCAD data for 2010, the overall incidence of repeat testing among 15 to 24 year olds repeat testing was 18 and 26 per 100 person years in the NCSP dataset and GUMCAD respectively. Rates of repeat testing were found to be higher following a positive test (Figure 4). As stated in section 2, and consistent with several other studies, the proportion testing positive at repeat test was higher among those with a positive test at baseline compared to those with a negative baseline test[10].

Figure 4 (a-b): Incidence of repeat testing, 15 to 24 year olds by gender and result at baseline test[10]



In comparison to reported rates of partner change from the National Survey of Sexual Attitudes and Lifestyles (Natsal) conducted in 2000, the overall observed rates of repeat testing were at least 25% lower for women and 50% lower for men, than could be expected if everyone were to have a test each time they had a new sexual partner[10].

In the same analysis of NCSP and GUMCAD data, reporting a recent partner change and having a positive test at baseline were both found to be strong, independent predictors of infection at repeat test. For example among women, the AOR of testing positive for individuals reporting a new sexual partner within the previous 3 months was 1.52 (95% CI 1.38 to 1.68) and women with a previous positive test had almost twice the odds of testing positive at repeat test than those who tested negative at their baseline test (AOR 1.95, 95% CI 1.76 to 2.16). This suggests that encouraging both testing on change of sexual partner and re-testing following a chlamydia diagnosis might have a role in identifying additional and treating infections.

While it is feasible that routine re-testing after a positive could identify additional infections that might either go untreated or be diagnosed later in the course of infection, the number of additional infections that could be identified has not been demonstrated in practice. It is feasible that re-infection rates among people who do not return for re-testing are lower than for those who do return (section 2). The number of repeat diagnoses that could be identified over and above those achieved with existing testing practices and recommendations will depend firstly on the re-infection rate in those who currently do not get re-tested, and secondly the uptake rate of re-testing in addition to existing practices.

Maintaining high levels of appropriate repeat testing – both among those testing positive, and those testing negative but at risk of infection – is likely to be important for maintaining high levels of chlamydia screening coverage and diagnosis rates. In a recent analysis of data from Cornwall, where all chlamydia tests were available in a single dataset, 24% of tests among 13 to 25 year olds conducted between 2003 and 2009 were from individuals who had been tested at least once before, with higher proportions among those testing positive[11].

7. International experience

Key message
- Several countries already recommend repeat testing for chlamydia sooner than one year following a positive test - Reports from the US, Australia and the Netherlands suggest that achieved rates of repeat testing following a positive test vary in practice, and are likely to vary by method of encouraging repeat testing - Mailed screening kits, and telephone or text message reminders appear to increase repeat testing rates

Several countries including the United States, Canada, Australia and New Zealand recommend repeat testing for individuals following a positive chlamydia test (Table 1).

Table 1: International examples of repeat testing recommendations

Country	Recommended re-testing interval
USA	Approximately 3 months[25]
Canada	6 months [26]
Australia	3 months [27]
New Zealand	6 months[28]
Scotland	3-12 months, or sooner if there is a change of partner[29]

Achieved rates of repeat testing following a positive test vary in practice. Table 2 provides a summary of the achieved re-screening rates for several studies in the US, Australia and the Netherlands. Comparisons between re-screening rates are limited, as the reported rates are from a range of different settings, age groups and genders, and present re-screening rates at varying time points.

A recent review of interventions aimed at increasing rates of re-screening summarised the results from 8 RCTs and 4 observational studies, all conducted in the US. Mailed screening kits were found to increase.

Re-testing rates (RR 1.30, 95%CI 1.10 to 1.50) and telephone reminders were considered promising, although no studies had reported the effectiveness of text message reminders on re-testing rates[30]. Two more recently published studies have found SMS reminders to have a substantial impact on re-testing rates[30;31].

Table 2: Achieved rates of repeat testing rate, published studies

Author	Country		Study setting	Method of encouraging re-screening	Interval	Percentage re-screened
No specific approach stated						
Dukers-Muijrers[32]	Netherlands	16 to 25 M & F	GPs	Not stated	3-12 mo.	23%
			Gynaecologists	Not stated	3-12 mo.	30%
			STI clinic	Not stated	3-12 mo.	33%
Hoover[33]	USA	M	Laboratory data	Not stated	within 1 year	22%
		Non-pregnant F	Laboratory data	Not stated	within 1 year	38%
Promotion of guideline						
Gindi[34]	USA	F	FP clinic	Promotion of guideline	1- 6 mo.	23%
Motivational interviewing						
Malotte[35]	USA	14 to 30 M & F	STD clinic	Motivational interviewing	≤ 3 mo.	12%
				Motivational interviewing + tel/letter reminder	≤ 3 mo.	24%
Financial incentive						
Malotte[35]	USA	14 to 30 M & F	STD clinic	Financial incentive	≤ 3 mo.	13%
Reminder						
Paneth-Pollak[36]	USA	M & F	STD clinic	Postcard reminder	2.5-4 mo.	14%
Gudgel[37]	USA	M & F	Primary Care Clinic	Phone, letter or email reminder	2.6- 6 mo.	16%
Downing[31]	Australia	<16 years M & F	Sexual Health Service	SMS reminders (+/- financial incentives)	10-16 wks	27%
Guy[30]	Australia	M & F	STD clinic	SMS reminder	1-4 mo.	30%
Malotte[35]	USA	14 to 30 year M & F	STD clinic	Phone reminder	≤ 3 mo.	33%
Kohn[38]	USA	F	STD clinic	Phone, letter reminder	1-5 mo.	37%
Mailed test kits						
Xu[39]	USA	>15 year old F	STD clinic	Mailed test kits	83-132 days	27%
			FP clinic	Mailed test kits	83-132 days	41%
Sparks[40]	USA	>14 year old M & F	STD clinic	Mailed test kits	28 days	45%
Gotz[9]	Netherlands	16 to 29 year old M & F	Chlamydia screening programme	Mailed test kits	6 mo.	66%

8. Cost-effectiveness of repeat testing

Key message

- No studies have reported the costs of different methods of repeat testing in England
- One study from the US found phone reminders to be more cost effective (in terms of numbers of infections treated) compared to motivational interviewing or a brief recommendation.

The costs and benefits of increased re-testing those who test positive and/or those with recent partner change will depend on the selected approach. One study in the US compared different interventions to increase repeat testing carried out among 14 to 30 year olds attending two STD

clinics in the US, the effect of financial incentives, reminder letters and phone calls and motivational counselling was evaluated in comparison to a verbal recommendation and provision of a reminder card. Phone reminders were found to achieve higher return rates and be more cost effective than motivational interviewing or a brief recommendation[41].

Other possible outcomes for economic evaluation of repeat testing approaches could include number of major outcomes averted (e.g. number of cases of PID or ectopic pregnancy prevented), or cost per additional quality adjusted life year gained. We are not aware of any studies that have assessed repeat testing in these terms.

9. Acceptability

Key message
- The acceptability of different approaches to encouraging re-testing has not investigated

No published studies have reported the acceptability among either young people or service providers of recommendations or interventions to encourage testing with change or sexual partner or at a specified interval after a positive test.

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