INTRODUCTION

- Chlamydia trachomatis is the most commonly diagnosed bacterial sexually transmitted infection in the UK.
- There is an average delay of several days between being tested for chlamydia and receiving test results.
- Point-of-care tests (POCTs) for chlamydia, where patients are tested and treated in the same visit, have potential to improve control of infection by:
  - reducing transmission by diminishing the delay in testing infection
  - treating a greater number of infections through reduced loss to follow-up of index patients
  - increasing uptake of screening due to greater convenience[1].
- The cost-effectiveness of POCTs depends on multiple interacting factors including:
  - the cost per test
  - test sensitivity and specificity
  - clinical pathways
  - the risk behaviour of patients
  - the characteristics of the population including rates of care-seeking and screening
- To enable commissioners, providers, POCT manufacturers and others to assess the cost-effectiveness of POCTs for chlamydia, we developed a user-friendly, web-based tool (POCTIC).

METHODS

The model population is divided into the following states representing transmission of infection, care-seeking and treatment:

- Uninfected (U)
- Infected Care-Seeking due to symptoms (F)
- Infected Non-Care-Seeking (I)
- Treated Presumptively (P*) due to symptoms
- Treated Post-test (P+)
- Treated Post-test, Screened (P++)

If patients are lost to follow-up (i.e. they do not return for treatment after testing positive by conventional testing), or treatment fails or they are rapidly re-infected then they enter the I state. They may then recover naturally, or be re-tested as a result of partner notification or screening.

POCTs eliminate loss to follow-up and reduce treatment delay.

- As accounting for the benefits of infections averted is an essential component of cost-effectiveness analysis, the web-tool is based on a transmission-dynamic model (Figure 1).
- The tool represents heterogeneity in coverage (annual per-capita rate of testing) and diagnosis rate (annual per-capita rate of diagnosis) at local levels (Figure 2) and examines its effect on the impact of introducing POCTs.
- The model uses behaviour and prevalence data from a national survey (National Survey of Sexual Attitudes and Lifestyles, NatSAL), and surveillance data (Public Health England, PHE) to inform on local-level variation, represented by sampling parameter values from within their ranges of uncertainty and selecting parameter sets that reproduce local coverage and diagnosis rates.
- Chlamydia data at local level in England record numbers of tests and diagnoses in 2014-2015 age only via:
  - GUIMCAFON, Genitourinary Medicine Clinic Activity Dataset
  - NCSPF, National Chlamydia Screening Programme
  - Laboratory reports outside of GUIM and not reported directly to NCSPF
- To calculate rates of testing and diagnosis, denominator local population sizes were obtained from the Office for National Statistics (ONS) for 326 Local Authorities (LAs) in England[2].
  - The 15-24 year age group was used to determine starting boundaries because these are the target ages for the NCSP in England[3] and have historically been the highest coverage and diagnosis rates than any other age group[4].
  - Local settings for modelling were created by stratifying coverage and diagnosis rates in both sexes to provide 3 levels: Low, Medium, and High. Most LAs were defined by a few ranges (Table 1).
- 22 local settings were chosen as starting scenarios for the tool (Figure 3).

<table>
<thead>
<tr>
<th>Table 1</th>
<th>Coverage ranges</th>
<th>Diagnoses rate in males</th>
<th>Diagnosis rate in females</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>Low</td>
<td>0.4</td>
<td>0.2</td>
</tr>
<tr>
<td>Medium</td>
<td>Medium</td>
<td>0.8</td>
<td>0.7</td>
</tr>
<tr>
<td>High</td>
<td>High</td>
<td>1.2</td>
<td>0.9</td>
</tr>
</tbody>
</table>

- The model (stratified by age, sex and partner change rate)[5] describes chlamydia transmission in a heterosexual population aged 15-44 years assuming a stable population structure (data for 2015[6]).
- We generated 20,000 unique parameter sets using Latin hypercube (LHC) sampling[7], varying:
  - the parameters fitted at the national level, and
  - at local level: the number of partners found per index case, annual screening rate, and proportion in the high-activity group, for each sex (reflecting variation in screening activity and diagnosis)[7].
- Candidate parameter sets were provisionally accepted if the equilibrium coverage and diagnosis rate for 15-24 year olds of each sex fell within the ranges defined in Table 1; the 80 parameter sets with prevalence closest to the national average were selected for each setting.

THE TOOL: POCTIC

- The web-tool gives a mechanism to inform decision-making by providing information about the expected impact of introducing POCTs for chlamydia.
- A user group consisting of industry, sexual health facilitators, sexual health commissioners, clinicians, public health experts, and healthcare consultants, provided input throughout.
- The web-tool aims to offer users the ability to investigate how POCT implementation for chlamydia might impact their local area (e.g. Upper Tier Local Authority). This tool will not give a definitive answer but can help guide users toward sensible decisions (Figure 4).

FINDINGS

- Users can use the tool to determine the effectiveness and cost-effectiveness of implementing POCTs in a particular setting.
- Model results indicate that POCTs will reduce incidence, with the magnitude of the impact varying across different local settings. The amount of uncertainty in the model outcome also varies significantly between different local settings. Therefore, it might be cost-effective to implement POCTs in one local scenario but not in another.
- The effect of POCTs was dependent on both the test performance characteristics (sensitivity and specificity) and the assumptions about the implementation of the test across local services. The cheaper the POCT, the greater the cost-effectiveness provided sensitivity and specificity of the POCT match current tests (nucleic acid amplification tests, NAATs).
- Potential health impact of POCTs would be significant if their use led to improved screening rates.

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REFERENCES