



Public Health  
England

Protecting and improving the nation's health

# **Surveillance of antimicrobial resistance in *Neisseria gonorrhoeae* in England and Wales**

## **Key findings from the Gonococcal Resistance to Antimicrobials Surveillance Programme (GRASP)**

Data to June 2017

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## 1. Key points

- current first-line treatment for gonorrhoea in the UK is dual therapy with ceftriaxone (500mg IM) and azithromycin (1g oral), but effectiveness of treatment is threatened by antimicrobial resistance
- between 2015 and 2016, gonococcal isolates collected through PHE's sentinel surveillance system showed:
  - no resistance to ceftriaxone
  - a decline in azithromycin resistance from 9.8% to 4.7%
  - an increase in cefixime resistance for the second consecutive year from 0.4% to 1.7%
  - a decline in resistance to ciprofloxacin from 41.9% to 33.7% and to penicillin from 17.6% to 13.9%
- between January 2015 and June 2017, gonococcal isolates referred to PHE's national reference laboratory confirmed:
  - two cases of ceftriaxone resistance (MIC >0.125mg/L)
  - 325 cases of azithromycin resistance (MIC >0.5mg/L) of which 81 exhibited high-level resistance to azithromycin (MIC ≥256mg/L)
  - one case of treatment failure after dual therapy with ceftriaxone and azithromycin, reported in April 2015; no further cases have been confirmed by the reference laboratory as of June 2017

## 2. Recommendations

- all primary diagnostic laboratories should test gonococcal isolates for susceptibility to first-line antimicrobials and refer suspected azithromycin- and/or ceftriaxone-resistant isolates to PHE's national reference laboratory for confirmation and follow-up
- practitioners should ensure that all patients with gonorrhoea are treated and managed according to [national guidelines](#), and should be alert to changes in antimicrobials recommended for first-line use
- sexual health services should report possible cases of treatment failure to PHE via the online [HIV and STI web-portal](#)
- anyone having sex with new and/or multiple sexual partners should be advised to use condoms consistently and correctly and to get tested regularly for sexually transmitted infections

## 3. Introduction

Gonorrhoea is the second most common bacterial sexually transmitted infection (STI) in the UK and, if untreated, can lead to complications such as long-term pelvic pain, pelvic inflammatory disease, ectopic pregnancy, and infertility in women. Gonorrhoea tends to be concentrated among specific population groups, especially young adults, black Caribbean people and men who have sex with men (MSM). In 2016, there were 36,244 reported diagnoses of gonorrhoea in England<sup>1</sup>. Current first-line treatment for gonorrhoea in the UK is dual therapy with ceftriaxone (500mg IM) and azithromycin (1g oral).

In 2017, *Neisseria gonorrhoeae* was included as a “High Priority” organism in the World Health Organization’s global priority list of antibiotic-resistant bacteria<sup>2</sup>. Ongoing monitoring of antimicrobial resistance (AMR) is vital to ensure that first-line treatment for gonorrhoea remains effective as patterns of resistance can change rapidly<sup>3</sup>. Ineffective treatment facilitates onward transmission and development of adverse sequelae.

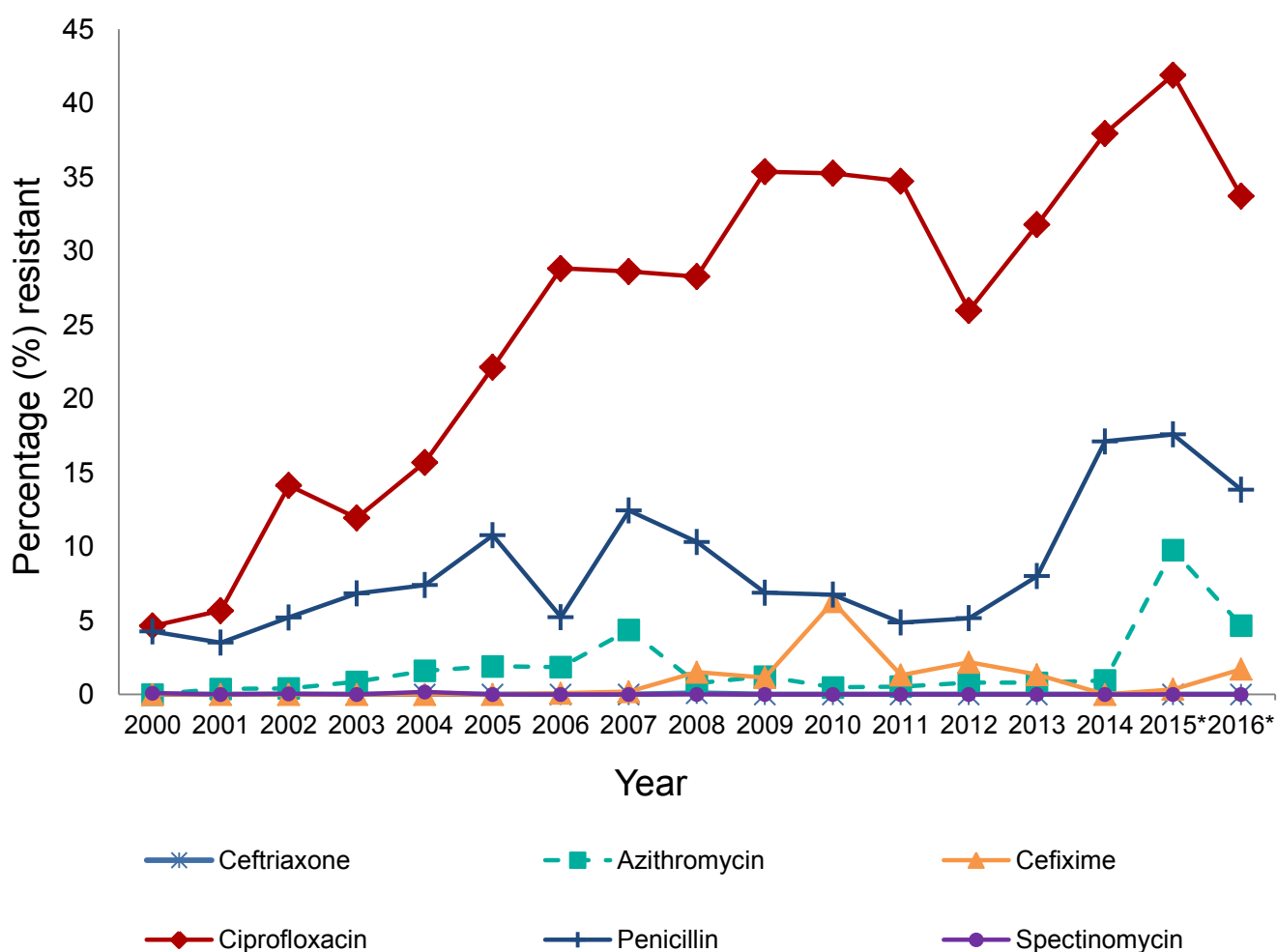
This report presents trends in gonococcal susceptibility to current and previous antimicrobials used for treatment of gonorrhoea, and explores the recent epidemiology of clinically-relevant AMR. The Gonococcal Resistance to Antimicrobial Surveillance Programme (GRASP) includes a suite of initiatives to detect and monitor AMR in *N. gonorrhoeae* and potential treatment failures.

Data from the national sentinel surveillance system (data from July to September 2016) are supplemented by data from the Second Generation Surveillance System (SGSS) (data from January 2015 to June 2017) and from PHE’s national reference laboratory (data from January 2015 to June 2017). All results are interpreted using EUCAST breakpoints<sup>4</sup>.

## 4. Antimicrobial susceptibility

*Neisseria gonorrhoeae* has developed resistance to all classes of antimicrobials used to treat the infection. Figure 1 and Table 1 show trends in the prevalence of resistance in gonococcal isolates collected through the GRASP sentinel surveillance system for the past 17 years and six years, respectively.

**Figure 1: Percentage of gonococcal isolates resistant to selected antimicrobials: England and Wales, 2000 to 2016**



\*Note: due to changes in the DST medium used to test antimicrobial susceptibility of sentinel surveillance system isolates, MICs for the 2015 and 2016 collection are not directly comparable with those from previous years; trends must be interpreted with caution, particularly for azithromycin<sup>5</sup>.

**Table 1. Percentage of gonococcal isolates in the sentinel surveillance system that were resistant to selected antimicrobials: England and Wales, 2011-2016**<sup>Footnote 1</sup>

Antimicrobials	Percentage resistant (number resistant)					
	2011 N=1,293	2012 N=1,374	2013 N=1,636	2014 N=1,565	2015* N=1,699	2016* N=1,284
Ceftriaxone (>0.125mg/L)	<b>0.0</b> (0)	<b>0.0</b> (0)	<b>0.0</b> (0)	<b>0.0</b> (0)	<b>0.0</b> (0)	<b>0.0</b> (0)
Azithromycin (>0.5mg/L)	<b>0.5</b> (7)	<b>0.8</b> (11)	<b>0.8</b> (13)	<b>1.0</b> (15)	<b>9.8</b> (166)	<b>4.7</b> (60)
Cefixime (>0.125mg/L)	<b>1.3</b> (17)	<b>2.2</b> (30)	<b>1.3</b> (22)	<b>0.0</b> (0)	<b>0.4</b> (6)	<b>1.7</b> (22)
Ciprofloxacin (>0.06mg/L)	<b>35.7</b> (449)	<b>26.0</b> (357)	<b>31.8</b> (520)	<b>38.0</b> (594)	<b>41.9</b> (712)	<b>33.7</b> (433)
Penicillin (>1.0mg/L)	<b>4.9</b> (63)	<b>5.2</b> (71)	<b>8.0</b> (131)	<b>17.1</b> (268)	<b>17.6</b> (299)	<b>13.9</b> (178)
Tetracycline (>1.0mg/L)	<b>69.7</b> (901)	<b>77.4</b> (1,064)	<b>80.0</b> (1,309)	<b>82.9</b> (1,297)	<b>39.4</b> (670)	<b>40.9</b> (525)
Spectinomycin (>64mg/L)	<b>0.0</b> (0)	<b>0.0</b> (0)	<b>0.0</b> (0)	<b>0.0</b> (0)	<b>0.0</b> (0)	<b>0.0</b> (0)

\*Note: due to changes in the DST medium used to test antimicrobial susceptibility of sentinel surveillance system isolates, MICs for the 2015 and 2016 collection are not directly comparable with those from previous years and trends must be interpreted with caution, particularly for azithromycin and tetracycline<sup>5</sup>.

## Susceptibility to current first-line antimicrobials

### Ceftriaxone

In 2016, 1,284 gonococcal isolates were collected through PHE's sentinel surveillance system; none were resistant to ceftriaxone, as was the case in 2015. The modal minimum inhibitory concentration (MIC) had also not changed since 2015 (MIC=0.008mg/L), but the proportion of isolates with MICs  $\geq$ 0.06mg/L increased from 0.9% (15/1,699) to 2.2% (28/1,284) (Figure 2). Isolates from MSM were less susceptible to ceftriaxone than isolates from heterosexual men and women (Figure 3).

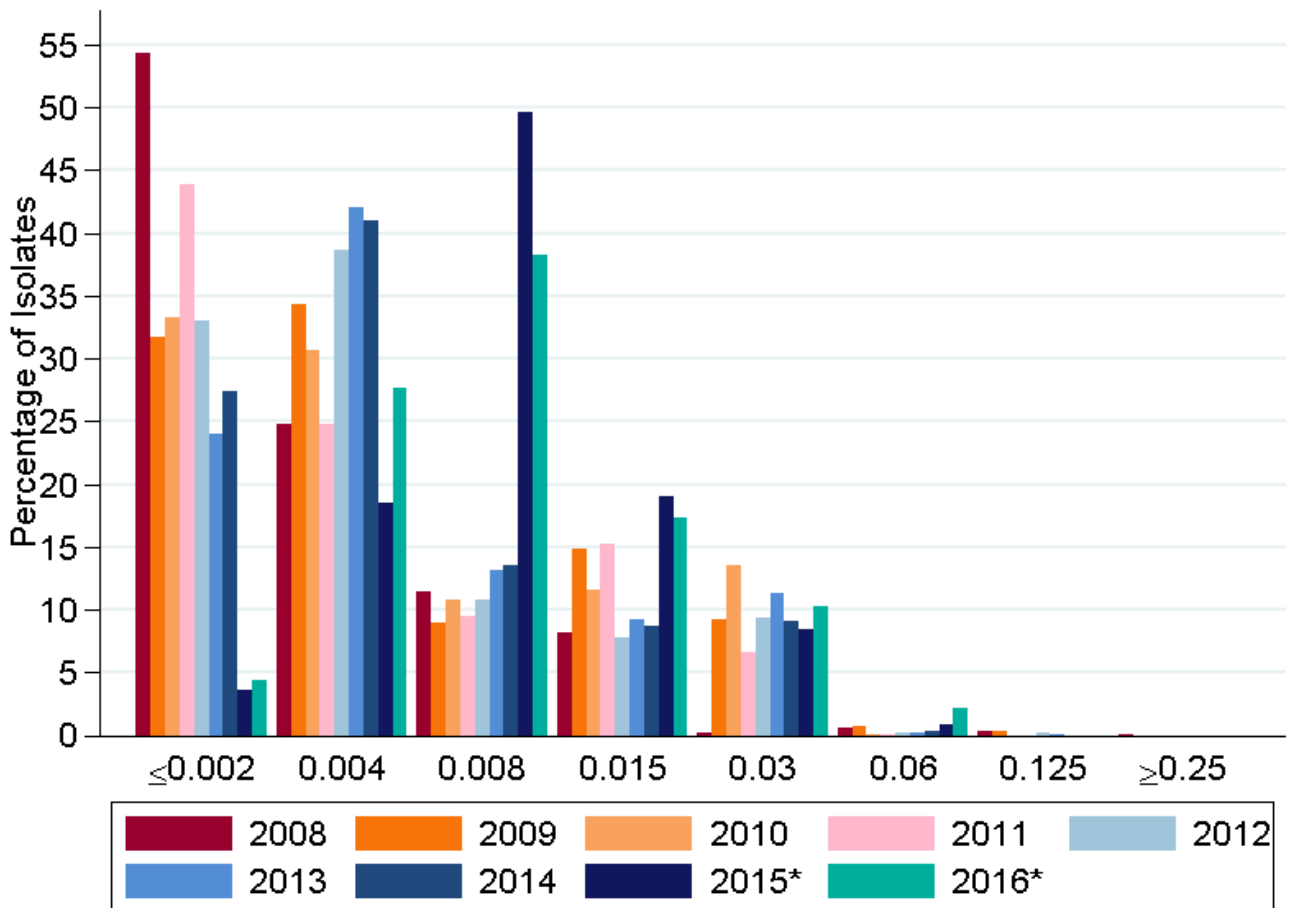
The percentage of isolates that were reported to be ceftriaxone resistant by primary diagnostic laboratories in SGSS and referred to the national reference laboratory has increased from 30% in 2015 to 45% as of June 2017 (Table 2).

Between January 2015 and June 2017, there have been two cases of ceftriaxone resistance confirmed by the national reference laboratory. The first, confirmed in April 2015, was also azithromycin resistant, and became the world's first documented case of treatment failure to dual ceftriaxone and azithromycin therapy<sup>6</sup>. The patient, who was

<sup>1</sup> The number of isolates included in the sample may differ from previous reports. Only data from isolates matched to GRASP clinics have been presented

eventually successfully treated with an increased dose of dual therapy (1g ceftriaxone IM and 2g azithromycin oral), was infected with a strain associated with decreased susceptibility to cephalosporins and azithromycin<sup>7,8</sup>. The second ceftriaxone resistant isolate, confirmed in May 2017, was sensitive to azithromycin.

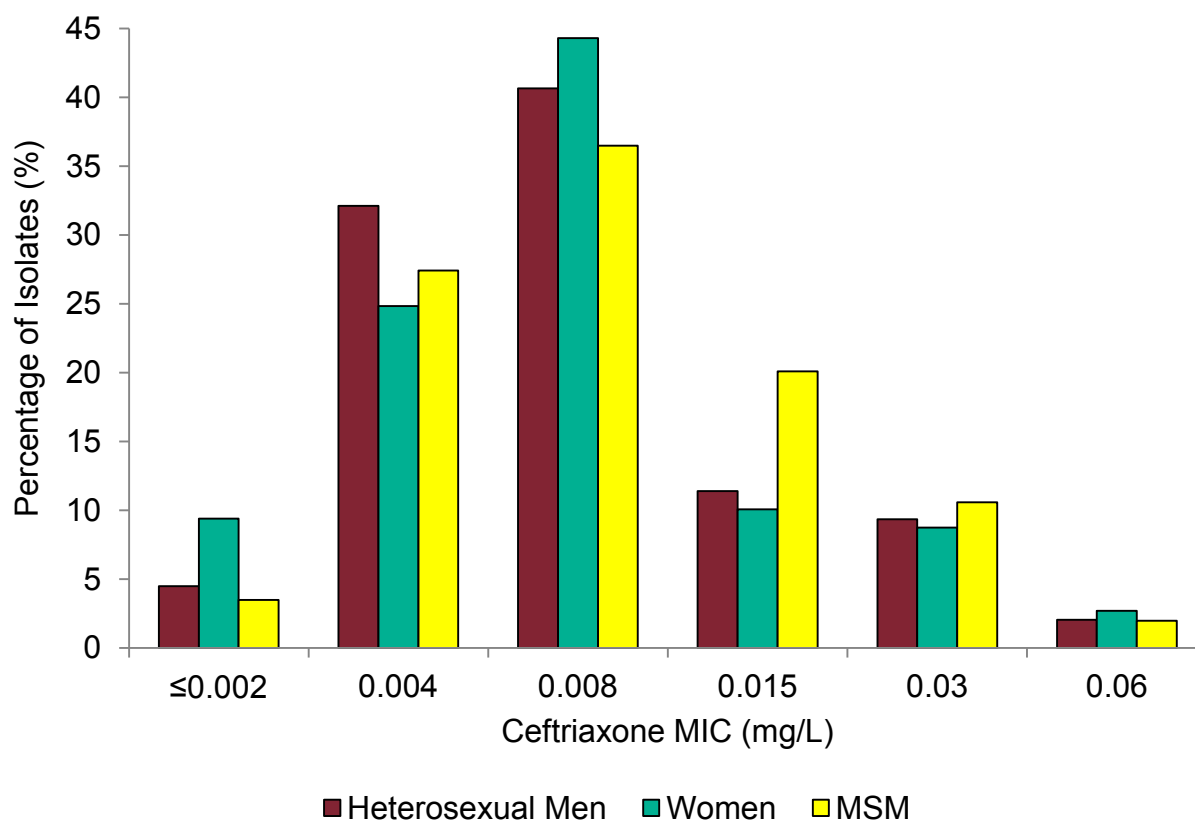
**Figure 2. Distribution of ceftriaxone MICs (mg/L) for gonococcal isolates within the sentinel surveillance system: England and Wales, 2008-2016**



\*Note: due to changes in the DST medium used to test antimicrobial susceptibility of sentinel surveillance system isolates, MICs for the 2015 and 2016 collection are not directly comparable with those from previous years and trends must be interpreted with caution, particularly for azithromycin and tetracycline<sup>5</sup>.



**Figure 3. Distribution of ceftriaxone MICs (mg/L) for gonococcal isolates by gender and sexual orientation within the sentinel surveillance system: England and Wales, 2016**



**Table 2. Ceftriaxone susceptibility testing and referral in SGSS: January 2015 to June 2017**

Ceftriaxone	2015	2016	2017 (Jan to June)
Total cultured isolates reported to SGSS; N	19,370	17,867	9,166
Tested for susceptibility; %	91.0	95.7	95.4
Reported resistant isolates referred to the national reference lab; %	30.3	35.4	45.0
Referred and confirmed resistant; N	0	0	1

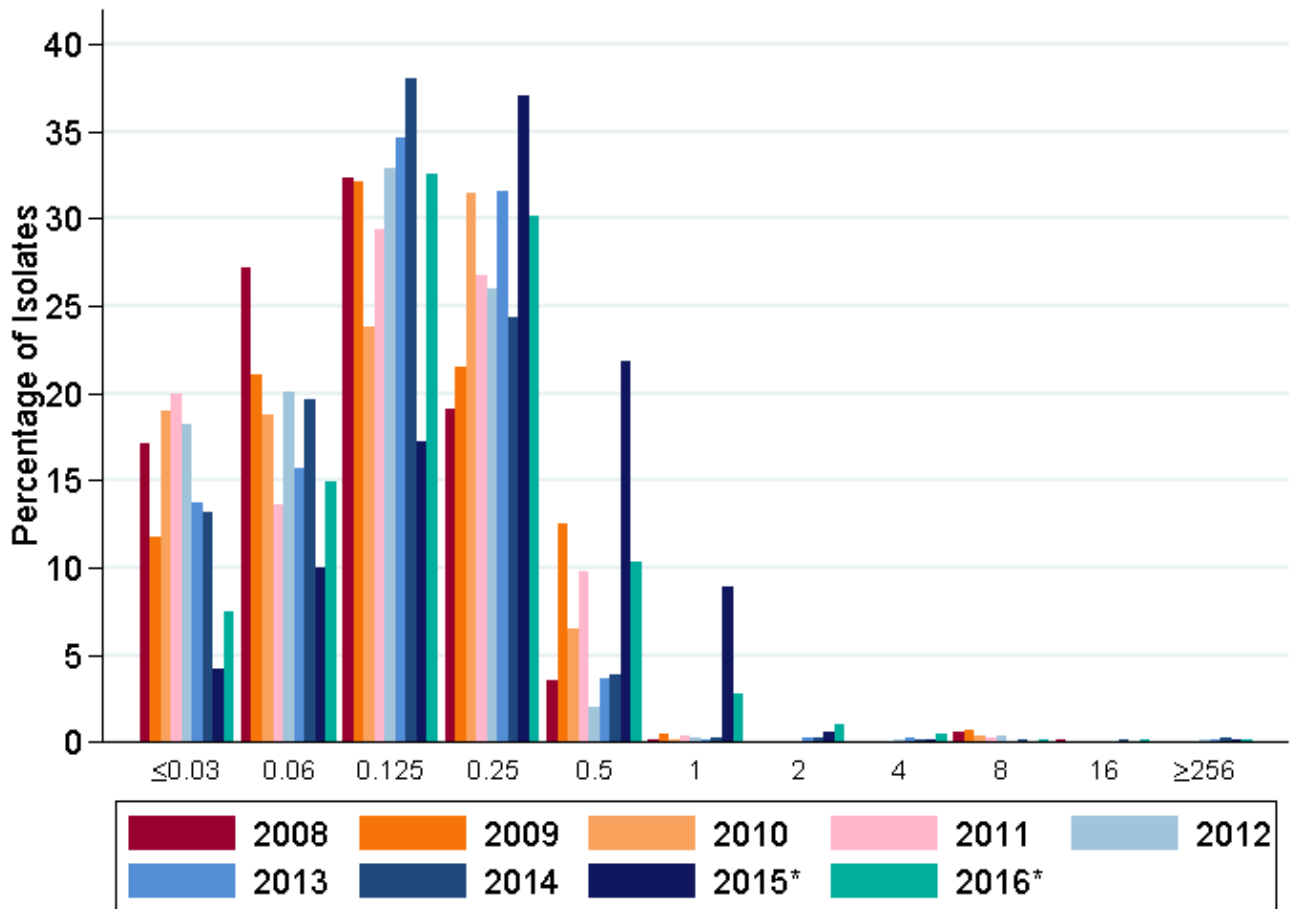
## Azithromycin

Between 2015 and 2016, among gonococcal isolates in the sentinel surveillance sample, the prevalence of azithromycin resistance (MIC >0.5mg/L) declined from 9.8% (166/1699) to 4.7% (60/1284) (Figure 1), and the modal MIC decreased from 0.25 mg/L in 2015 to 0.125 mg/L in 2016 (Figure 4). Isolates from heterosexual men were less susceptible to azithromycin than isolates from MSM or women (Figure 5). The MICs of ceftriaxone for isolates that were resistant to azithromycin ranged from 0.004 to 0.06mg/L (Figure 6).

The percentage of isolates that were reported to be azithromycin resistant by primary diagnostic laboratories in SGSS and referred to the national reference laboratory has increased from 34% in 2015 to 50% as of June 2017 (Table 3).

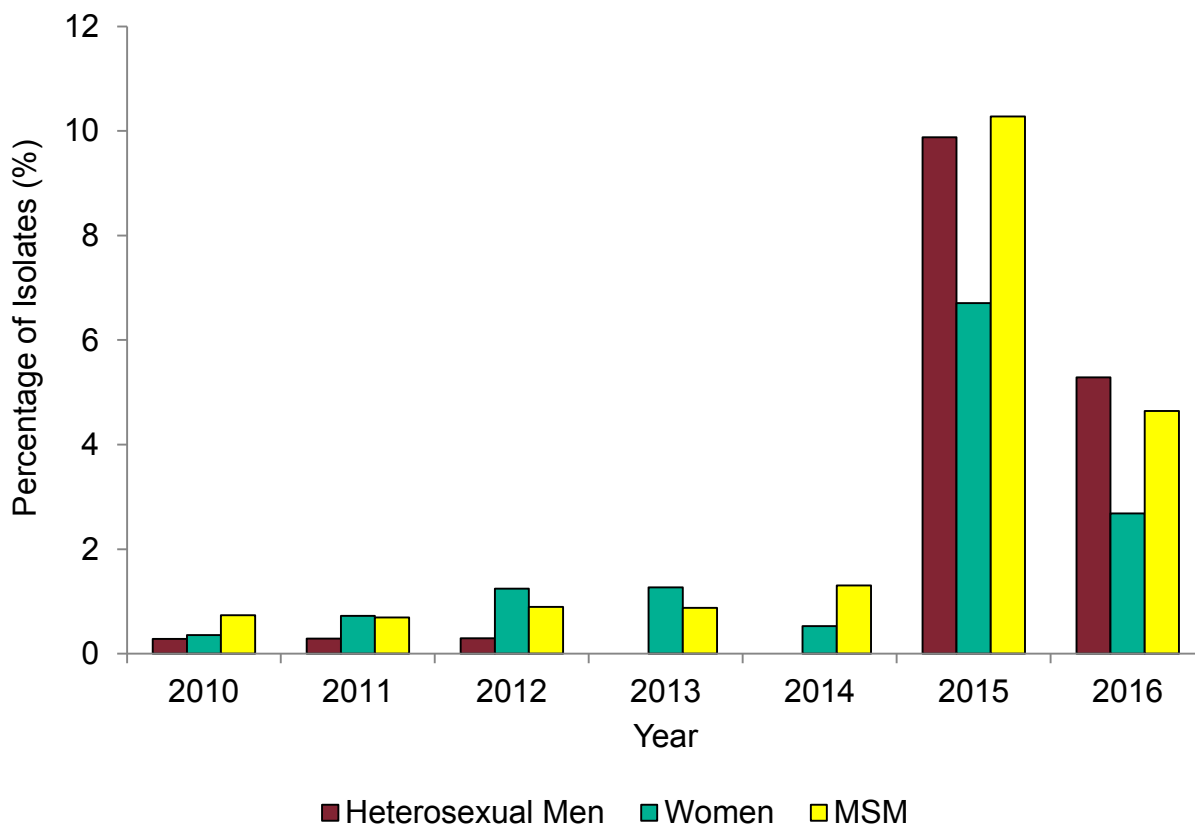
Of the isolates referred by primary diagnostic laboratories to the national reference laboratory, there were 325 cases of azithromycin resistance confirmed between January 2015 and June 2017. Of these 81 exhibited high-level resistance (HLAZiR; MIC $\geq$ 256 mg/L), 32 in 2015, 29 in 2016, and 20 as of June 2017. Cases occurred in both MSM and heterosexuals, and were reported from across England, although more than half of the cases in 2017 were from London. All of the HLAZiR isolates identified were sensitive to ceftriaxone, and all cases have been treated successfully.

**Figure 4. Distribution of azithromycin MICs (mg/L) for gonococcal isolates within the sentinel surveillance system: England and Wales, 2008 to 2016**



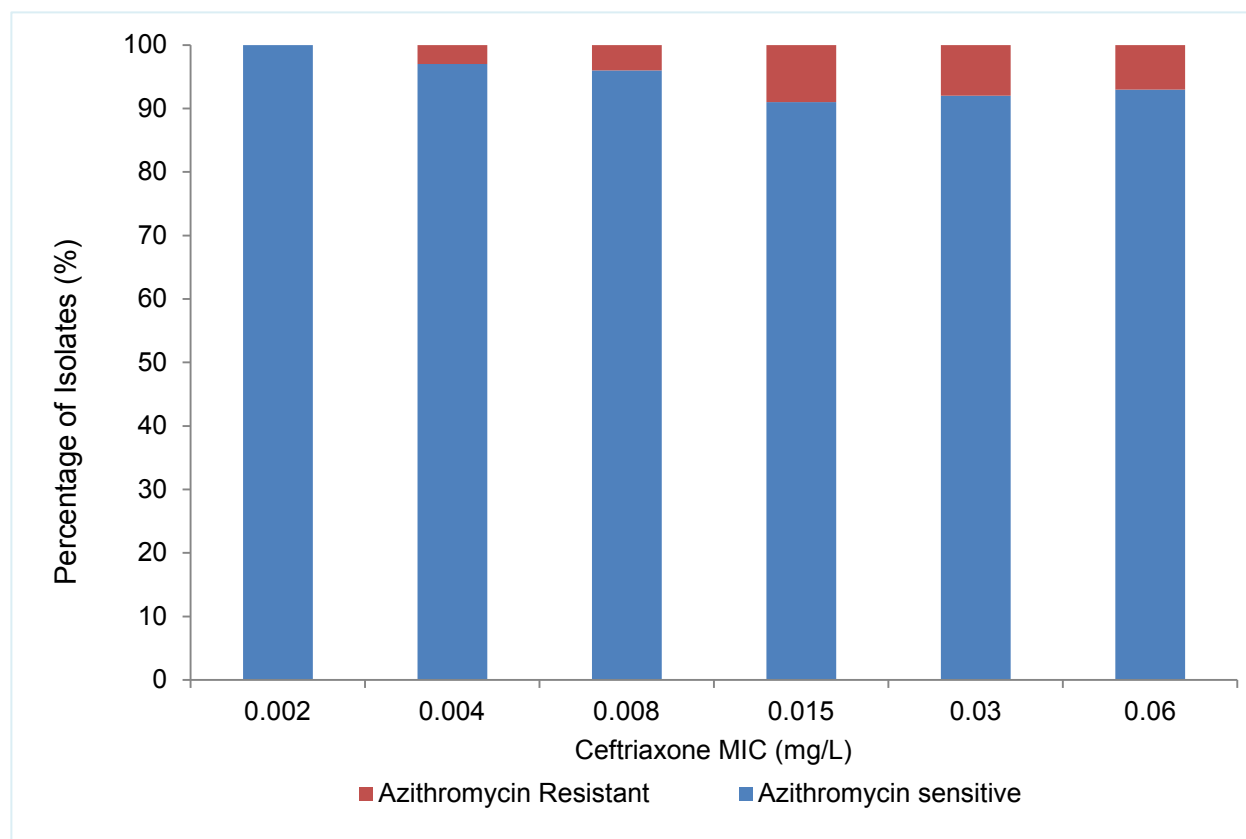
**\*Note: due to changes in the DST medium used to test antimicrobial susceptibility of sentinel surveillance system isolates, MICs for the 2015 and 2016 collection are not directly comparable with those from previous years and trends must be interpreted with caution, particularly for azithromycin and tetracycline<sup>5</sup>.**

**Figure 5. Percentage of azithromycin-resistant gonococcal isolates (MIC >0.5mg/L) by gender and sexual orientation within the sentinel surveillance system: England and Wales, 2006 to 2016**



**\*Note: due to changes in the DST medium used to test antimicrobial susceptibility of sentinel surveillance system isolates, MICs for the 2015 and 2016 collection are not directly comparable with those from previous years and trends must be interpreted with caution, particularly for azithromycin and tetracycline<sup>5</sup>.**

**Figure 6. Percentage of gonococcal isolates resistant to azithromycin (MIC >0.5mg/L) by ceftriaxone MICs (mg/L) within the sentinel surveillance system: England and Wales, 2016**



**Table 3. Azithromycin susceptibility testing and referral in SGSS: January 2015 to June 2017**

Azithromycin	2015	2016	2017 (Jan to June)
Total cultured isolates reported to SGSS; N	19,370	17,867	9,166
Tested for susceptibility; %	88.0	96.9	97.8
Reported resistant isolates referred to the national reference lab; %	34.0	48.2	50.5
Referred and confirmed resistant; N	102	126	79

## Susceptibility to other antimicrobials: cefixime, ciprofloxacin, penicillin, tetracycline and spectinomycin

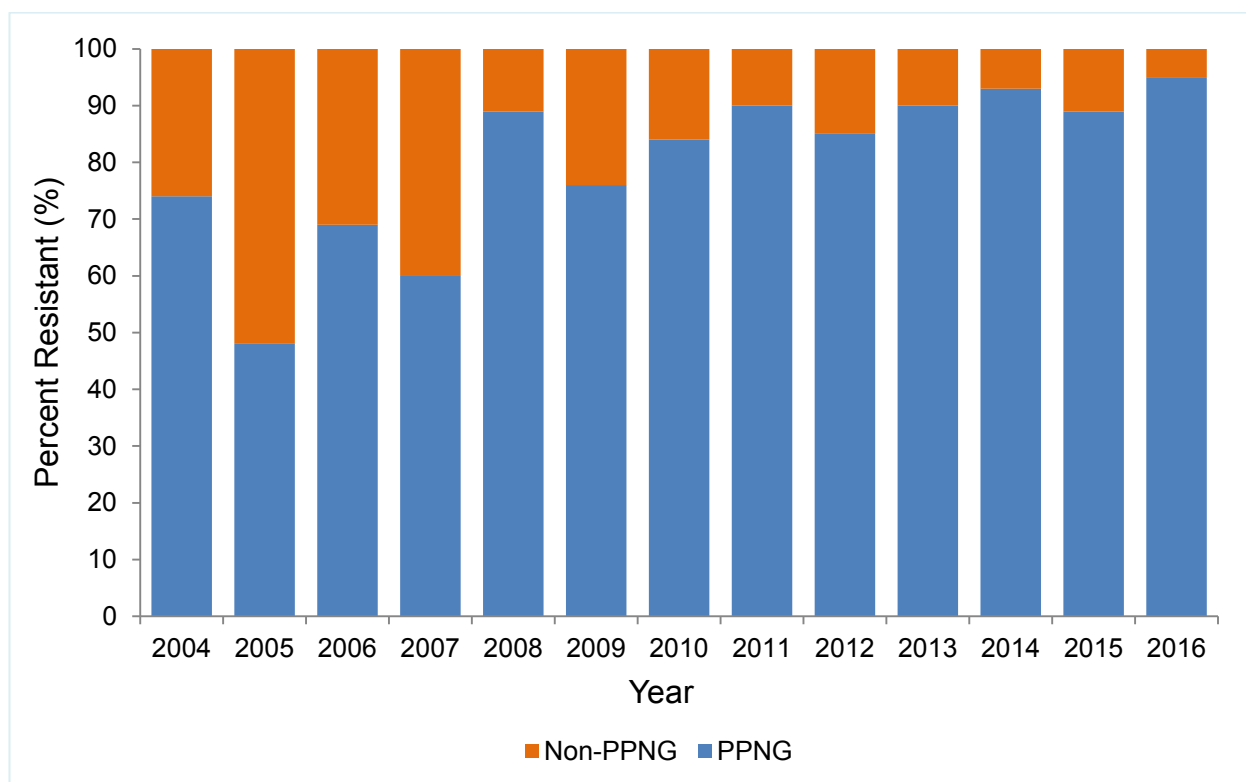
Between 2015 and 2016, among gonococcal isolates in the sentinel surveillance sample, the percentage resistant to cefixime increased from 0.4% (6/1699) to 1.7% (22/1284). This increase follows a declining trend in resistance in the period 2012-2014, following removal of cefixime as a recommended first-line treatment in 2011 (Table 1).

Resistance to each of ciprofloxacin, penicillin and tetracycline remained endemic in England and Wales, although there was a decline in the proportions of isolates resistant to ciprofloxacin from 41.9% (712/1699) to 33.7% (433/1284), and penicillin from 17.6% (299/1699) to 13.9% (178/1284) between 2015 and 2016 (Table 1).

Of isolates resistant to penicillin in 2016, 95% (175/184) were penicillinase-producing *N. gonorrhoeae* (PPNG), which have plasmid-mediated resistance, as opposed to only chromosomally-mediated resistance in non-PPNG (Figure 7).

No isolates were resistant to spectinomycin (Table 1).

**Figure 7: Percentage of penicillin-resistant isolates that were PPNG within the GRASP sentinel surveillance sample: England and Wales, 2004 to 2016**



## 5. Prescribing practice

Antimicrobial prescription data was available for 76% of gonorrhoea diagnoses made in clinics in the sentinel surveillance sample in 2016 (2446/3198). Of these, 94% received the recommended treatment of ceftriaxone (500 mg IM) in combination with azithromycin (1g oral), the same as in 2015 <sup>Footnote 2</sup> (Figure 8). In 2016, 95% of heterosexual men and 95% of MSM received the recommended treatment, compared with 92% of women.

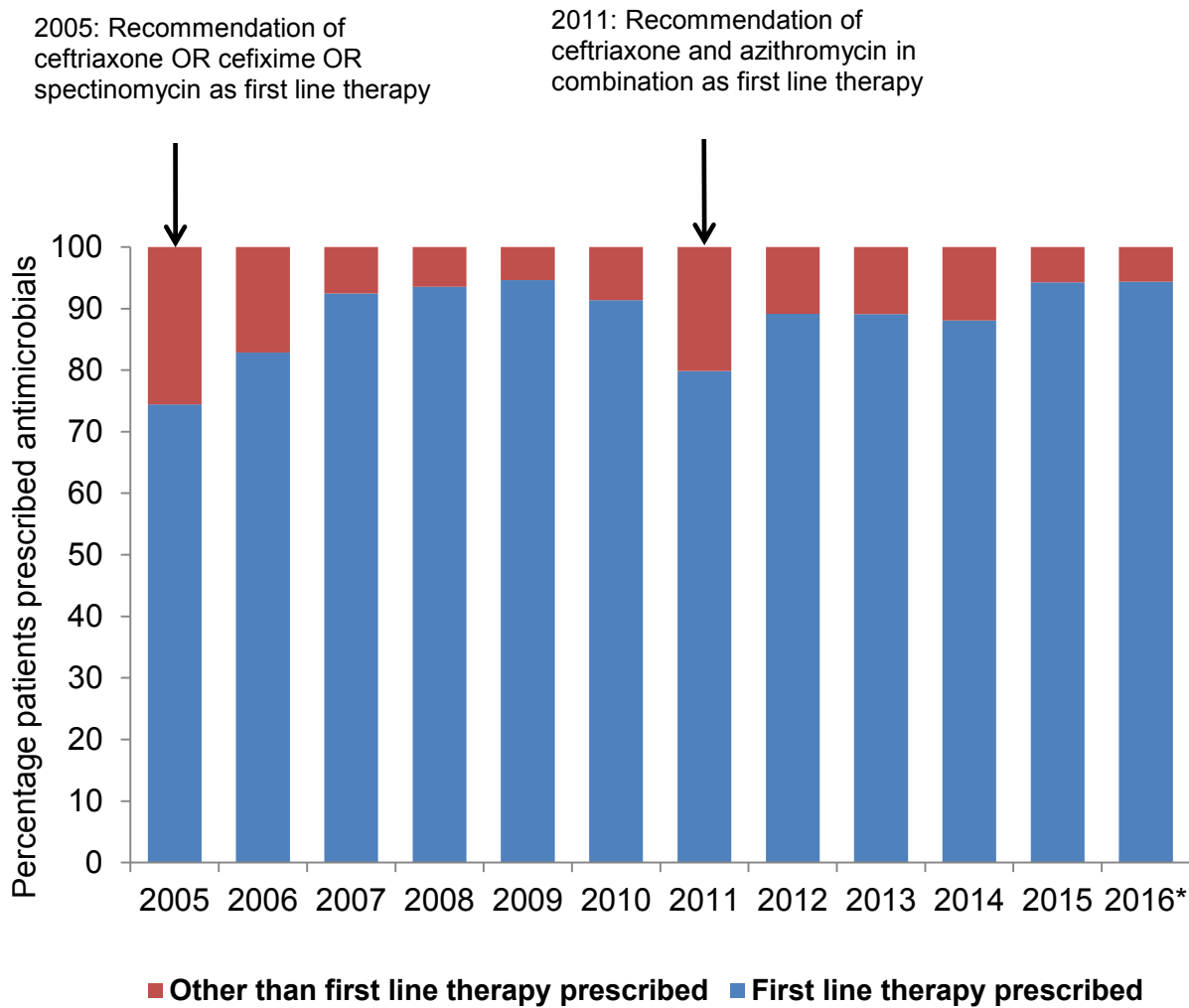
Of those patients not prescribed the recommended treatment (n=138):

- 31% (68/138) received combination therapy with azithromycin plus an antimicrobial that was not ceftriaxone; the majority were treated with azithromycin and spectinomycin (42/68)
- 26% (56/138) were prescribed monotherapy, of which 21 received azithromycin, 12 received doxycycline, 10 received spectinomycin, eight received ceftriaxone, and the remainder either ciprofloxacin or ofloxacin
- 6% (14/138) received combination therapy with antimicrobials other than azithromycin, including seven patients receiving ceftriaxone and doxycycline

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<sup>2</sup> Prior to 2016 the denominator includes only isolates within the sentinel surveillance system. In 2016, the denominator includes diagnoses made in GRASP clinics where prescription data was available.

**Figure 8: Antimicrobial prescribing practice: England and Wales, 2005 to 2016**<sup>Footnote 3</sup>



<sup>3</sup> Prior to 2016 the denominator includes only isolates within the sentinel surveillance system. In 2016, the denominator includes diagnoses made in GRASP clinics where prescription data was available.



## 6. Worldwide context

GRASP highlights the continuing problem of antimicrobial resistance in *N. gonorrhoeae*. There remains concern about the first line therapies used for treatment, ceftriaxone and azithromycin, as circulating gonorrhoea is becoming less susceptible to ceftriaxone and azithromycin resistance persists.

Similar trends are reported in other countries with antimicrobials susceptibility programmes in place. Recent data from the European Gonococcal Antimicrobial Surveillance Programme (Euro-GASP) detected azithromycin resistance in several of the 24 European countries studied<sup>9</sup>, and decreased susceptibility to ceftriaxone has been reported in Australia<sup>10</sup> and the US<sup>11</sup>.

# Appendix

## Methodology

### Sentinel surveillance system methodology

A total of 1,899 isolates of *N. gonorrhoeae* were sent to PHE from 23 participating English GUM clinics and 2 Welsh GUM clinics. 1,284 isolates were included in the 2016 GRASP analysis. Isolates not included in the analysis were either (i) not matched to clinical data/from a clinic in the sentinel surveillance system (221); (ii) duplicate isolates/isolates collected outside of the collection period (1 July 2016 to 9 September 2016) (144); (iii) irretrievable or contaminated isolates (183); and (iv) did not grow on Diagnostic Sensitivity (DST) agar with lysed blood (67).

The complete GRASP methodology can be accessed [online](#).

### Definitions of antimicrobial resistance in the sentinel surveillance system

GRASP uses EUCAST breakpoints to define susceptibility to a given antimicrobial.

#### Box 1: Definitions of antimicrobial resistance in the sentinel surveillance programme

Resistance classification	Definition
Resistance to ceftriaxone	Ceftriaxone MIC >0.125mg/L
Resistance to azithromycin	Azithromycin MIC >0.5mg/L
High-level resistance to azithromycin	Azithromycin MIC $\geq$ 256mg/L
Resistance to cefixime	Cefixime > 0.125mg/L
Resistance to ciprofloxacin	Ciprofloxacin MIC >0.06mg/L
Resistance to penicillin	Penicillin MIC >1.0mg/L and/or $\beta$ -lactamase positive
Penicillinase producing <i>N. gonorrhoeae</i> (PPNG)	$\beta$ -lactamase positive
Resistance to tetracycline	Tetracycline MIC >1.0mg/L
Resistance to spectinomycin	Spectinomycin MIC >64mg/L

## SGSS data extraction methodology

Data on *N. gonorrhoeae* isolates tested for antimicrobial susceptibility in January 2015 to June 2017 were from SGSS. There are two sub-repositories within SGSS that hold data on antimicrobial susceptibility: the communicable disease reporting (CDR) repository and the antimicrobial resistance (AMR) repository. Data was extracted from both repositories and duplicate records were removed (ie the same record is found in both the CDR and AMR repository). Episodes of infection were generated by removing multiple specimens and specimen sites within a six week period per patient. If more than one isolate was collected from a patient, where resistance or antimicrobial susceptibility testing profiles differed, the resistant code was preferentially kept and the entire episode was considered susceptibility tested. Isolates with an ocular specimen site were removed prior to restricting isolates to one episode per six week period.

In primary diagnostic labs, ceftriaxone and cefixime susceptibility can be inferred by testing cefuroxime as a proxy cephalosporin. If a gonococcus is found susceptible to cefuroxime it may be reported susceptible to ceftriaxone or cefixime. However, if the isolate is resistant to cefuroxime, resistance to ceftriaxone or cefixime cannot be inferred and labs should perform an E-test to determine the ceftriaxone or cefixime MIC. Hence, where the ceftriaxone or cefixime susceptibility results were missing and cefuroxime was reported susceptible, the ceftriaxone or cefixime result was recorded as susceptible. However, where the ceftriaxone or cefixime susceptibility results were missing and cefuroxime was reported resistant, the ceftriaxone or cefixime result was recorded as missing since there was no way to verify whether a ceftriaxone resistance confirmatory E-test was done or the result.

Isolates reported to SGSS as ceftriaxone or azithromycin resistant by primary diagnostic laboratories were linked to the PHE national reference laboratory database based on available patient information. This was used to calculate the percentage of isolates successfully referred to and confirmed resistant by the PHE national reference laboratory.

## Characteristics of patients in the sentinel surveillance system

**Table 5. Characteristics of patients in the sentinel surveillance system, by gender and sexual orientation: 2016**

	Women	Heterosexual men	MSM*	Not reported	Total
<b>Total (N)</b>	<b>149</b>	<b>246</b>	<b>861</b>	<b>28</b>	<b>1,284</b>
<b>Patient residence</b>	<b>%</b>				
London	42.3	50.0	76.7	60.7	67.2
Outside London	57.7	49.6	23.3	39.3	32.7
Not reported	0.0	0.4	0.0	0.0	0.1
<b>Ethnicity</b>					
White	51.7	41.1	73.6	75.0	64.9
Black Caribbean	12.7	15.0	2.0	0.0	5.7
Black African	4.7	11.0	1.5	0.0	3.7
Black other	2.7	5.3	0.5	0.0	1.6
Asian (including Chinese)	5.4	6.5	3.1	3.6	4.0
Other ethnic group	3.3	2.4	3.7	3.6	3.4
Mixed ethnic group	9.4	10.6	5.7	10.7	7.2
Not reported	10.1	8.1	9.9	7.1	9.5
<b>Age group (years)</b>					
13-19	15.5	8.1	1.9	0.0	4.6
20-24	43.6	24.4	17.5	17.9	21.9
25-34	23.5	43.1	44.8	39.3	41.9
35-44	8.7	14.2	19.2	21.4	17.1
≥45	4.7	8.1	9.9	17.9	9.1
Not reported	4.0	2.1	6.7	3.5	5.4
<b>Symptoms</b>					
Discharge and/or Dysuria	51.7	81.3	42.5	57.1	51.3
No Discharge and/or Dysuria	35.6	13.8	37.8	25.0	32.6
Not reported	12.7	4.9	19.7	17.9	16.1
<b>Previously diagnosed with gonorrhoea</b>					
Yes	10.1	5.3	21.8	7.1	17.0
No	85.9	91.9	71.2	89.3	77.3
Not reported	4.0	2.8	7.0	3.6	5.7
<b>Concurrent STI**</b>					
Syphilis	0.0	0.0	1.5	3.6	1.1
Chlamydia	24.8	25.6	16.4	14.3	19.1
Herpes	0.0	1.2	0.7	0.0	0.7
Warts	1.3	1.2	1.1	0.0	1.1
LGV	0.0	0.0	0.5	0.0	0.3
Hepatitis B	0.0	0.0	0.0	0.0	0.0
Hepatitis C	0.0	0.0	0.2	0.0	0.1
New HIV diagnoses	0.0	0.0	0.9	3.6	0.7

<b>Site of infection***</b>					
Genital	89.3	89.8	42.0	64.3	57.1
Rectal	11.4	6.9	60.1	46.4	44.1
Throat	18.1	7.3	49.1	46.4	37.5
Other (not specified)	0.0	3.3	0.8	0.0	1.2
Not reported	4.0	2.0	6.7	3.6	5.5
Multiple site of infection	21.5	10.2	48.2	50.0	37.9
<b>HIV status</b>					
Positive	1.3	0.0	18.8	14.3	13.1
Negative	63.8	60.2	42.9	64.3	49.1
Not reported/Unknown	34.9	39.8	38.3	21.4	37.8
<b>Total partners (past 3 months)</b>					
0-1	59.0	36.6	15.1	21.4	24.4
2-5	19.5	49.6	29.2	32.2	32.0
6-10	2.0	4.1	5.7	0.0	4.8
11+	2.7	1.2	4.4	7.1	3.7
Not reported	16.8	8.5	45.6	39.3	35.1
<b>Sex abroad</b>					
Yes	8.7	19.9	7.4	7.1	10
No	74.5	71.6	46.9	53.6	55
Not reported	16.8	8.5	45.7	39.3	35.0
<p>* Men who have sex with men</p> <p>** Numerator: patients in GRASP 2016 dataset with diagnosed concurrent STI, Denominator: all patients in GRASP 2016 dataset. Not all patients are tested for each STI.</p> <p>*** Numerator: patients in GRASP 2016 dataset infected at site specified, Denominator: all patients in GRASP 2016 dataset. Not all patients are tested for gonorrhoea at each site. Data reported is for patients infected with at least the specified site, not exclusively this site.</p>					

Table 6. Antimicrobial resistance (MICs) by patient characteristic, sentinel surveillance system: 2016 <sup>Footnote 4</sup>

Characteristics	Total N†	Azithromycin (>0.5mg/L) row %	Cefixime (>0.125mg/L) row %	Ciprofloxacin (>0.06mg/L) row %	Penicillin (>1mg/L) row %	Tetracycline (>1mg/L) row %
<b>Age group</b>	1,284	4.7	1.7	33.7	13.9	40.9
13-24	340	3.8	3.2	27.1	15.3	32.9
25-34	538	5.6	1.5	35.9	13.2	42.4
35-44	219	4.1	0.5	35.6	11.9	46.6
>=45	117	3.4	0.0	36.8	16.2	40.2
<b>Sexual orientation</b>						
Heterosexual Men	233	5.3	2.9	32.5	16.3	36.6
MSM	821	4.7	1.1	36.2	14.4	45.1
Women	145	2.7	4.0	20.1	9.4	22.8
<b>Ethnicity</b>						
White	833	5.4	1.3	35.2	13.8	43.5
Black Caribbean	73	2.7	0.0	24.7	15.1	27.4
Black African	47	2.1	2.1	23.4	21.3	31.9
Black Other	21	0.0	0.0	19.1	9.5	33.3
Asian (including Chinese)	52	1.9	5.8	42.3	11.5	38.5
Other ethnic group	44	6.8	2.3	43.2	11.4	34.1
Mixed ethnic group	92	1.1	2.2	30.4	12.0	33.7
<b>Total partners (past 3 months)</b>						
0-1	314	4.1	2.2	26.1	14.0	36.3
2-5	411	4.1	1.7	34.6	15.3	38.7
6+	109	6.42	0.9	46.8	11.0	50.5
<b>Sex abroad</b>						
No	706	4.11	1.4	31.4	13.0	38.8
Yes	128	6.25	3.9	41.4	21.09	42.2
<b>Symptoms</b>						
No	419	5.3	1.43	36.0	11.7	43.7
Yes	659	4.1	1.8	31.9	15.5	38.9
<b>Previously diagnosed with gonorrhoea</b>						
No	992	5.0	1.6	31.6	13.6	40.3
Yes	218	2.8	1.8	42.2	15.1	40.4
<b>HIV status</b>						
Negative	630	5.1	1.9	32.9	13.7	40.8
Positive	168	3.6	0.0	39.9	12.5	47.0
<b>Patient residence</b>						
Outside London	420	3.8	1.9	26.0	14.5	37.9
London	863	5.1	1.6	37.5	13.6	42.3

†N is the number of patients for which information was reported for the particular characteristic

<sup>4</sup> No isolates were resistant to ceftriaxone or spectinomycin in the 2016 sentinel surveillance collection

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