Conclusion Culture and antibiotic susceptibility testing remains essential in gonorrhoea management in regard of recent surveillance data suggesting that cephalosporins are becoming less effective in the treatment of gonorrhoea. Our data suggest that treatment failures with oral cefixime may occur even in infections with cefixime susceptible N. gonorrhoeae strains.

P5.096 ESTIMATING THE POTENTIAL ECONOMIC IMPACT OF ANTIMICROBIAL RESISTANCE IN *NEISSERIA GONORRHOEAE* IN THE UNITED STATES

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Background Antimicrobial resistance to treatment can hinder gonorrhoea prevention and control efforts, thereby leading to increases in gonorrhoea incidence. We estimated the economic burden of potential increases in gonorrhoea incidence in the US as a result of emerging cephalosporin resistance.
Methods The potential increase in gonorrhoea due to resistance was based on an analysis of historical gonorrhoea incidence and ciprofloxacin resistance data. We used clinic-level resistance data from the Gonococcal Isolates Surveillance Project (GISP) and city-level gonorrhoea incidence rates from surveillance data for 17 GISP cities from 1991 to 2006. We performed a regression analysis in which the gonorrhoea rate (log) was the dependent variable and the independent variable of interest was the percentage of GISP isolates (from the clinic in the respective city) resistant to ciprofloxacin. To estimate the cost of potential increases in gonorrhoea, we used STIC-Figure, a spreadsheet programme that applies published equations of the economic impact of STDs.
Results The regression analysis found a significant, positive association ($p < 0.01$) between ciprofloxacin resistance and gonorrhoea incidence at the city level. The results suggested that an increase in resistance from 0% to 10% of isolates could result in a net increase in gonorrhoea of about 7% (range: 3% - 12%) in the first year and 17% (range: 6% - 28%) after ten years. Over ten years, the estimated impact would be substantial: 48,000 additional cases of PID, 5,000 additional cases of epididymitis, and 560 additional HIV infections, with direct medical costs totaling $405 million (range: $152 million - $689 million).
Conclusions Ciprofloxacin resistance was associated with increased gonorrhoea rates, despite availability of alternative treatments at the time. Correspondingly, emerging cephalosporin resistance could have substantial health and economic consequences. Efforts to control the spread and reduce the consequences of resistant strains can mitigate this potential burden.

P5.097 POTENTIAL POPULATION-LEVEL IMPACT OF REPLACING ORAL GONOCOCCAL THERAPY WITH INTRAMUSCULAR THERAPY

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Background The role of oral drugs in gonorrhoea treatment is controversial, and the effect of eliminating oral treatments is unknown.
Methods We created an arithmetic model to estimate the number of treatment failures (including no treatment) among persons with gonorrhoea and their first generation sex partners comparing current treatment patterns to treatment using only intramuscular drugs. Our base case scenario assumed: decreased susceptibility in 2% and 5% of cases in heterosexuals and men who have sex with men (MSM), respectively; oral therapy use in 30% of heterosexuals and 15% of MSM; treatment failure in 10% of persons with decreased susceptibility gonorrhoea given oral therapy; elimination of oral therapy results in 5% of oral treatment patients going untreated; expedited partner therapy (EPT) is offered to 40% of heterosexuals and increases the number of infected partners treated per case by 0.165.
Results In our base case scenario, elimination of oral treatment decreased the number of decreased susceptibility treatment failures relative to the total number of decreased susceptibility cases by 0.8% if one ignores the effect of EPT, and increased decreased susceptibility cases by 0.8% with an EPT effect included. Total gonorrhoea cases increased by 0.8% and 4%, with and without an EPT effect, respectively. Assuming 50% of heterosexuals and 25% of MSM receive oral therapy at baseline and that 20% of decreased susceptibility cases fail oral treatment, elimination of oral therapy diminished decreased susceptibility cases 2.6% and 1.4% with and without an EPT effect, respectively, while increasing total gonorrhoea cases 1.5–4.8%.
Conclusions Given plausible current levels of treatment efficacy, eliminating oral gonorrhoea therapy in the U.S. would likely have a small effect on decreased susceptibility treatment failures, and would somewhat increase gonorrhoea morbidity. These findings do no incorporate longer-term transmission effects, but highlight the importance of developing effective oral gonorrhoea treatment options.

P5.098 CLINICAL PREDICTION OF FLUOROQUINOLONE SUSCEPTIBILITY, DIRECTLY FROM RESIDUAL ROUTINE NAAT GONOCOCCAL-POSITIVE SAMPLES USING A *GYRA* SNP DETECTION ASSAY

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Background Antimicrobial resistance in *Neisseria gonorrhoeae* (NG) poses significant challenges for empirical therapy, heightened by nucleic acid amplification tests (NAAT) use over culture for diagnosis. Molecular susceptibility testing, directly on NAAT-positive clinical samples may allow fluoroquinolone use, currently precluded because community resistance rates are > 5%. We determined whether a genotypic resistance test performed directly on NG NAAT positive routine clinical samples predicted susceptibility to ciprofloxacin with > 95% confidence.
Methods A real time PCR SNP detection assay targeting the C > T SNP in codon 91 (S91P) of *gyrA*, commonly linked with other *gyrA* resistance associated SNPs, was used on 81 previously identified NG isolates, tested for ciprofloxacin MICs by E-test after sample blinding (Phase 1) and also (Phase 2) on 103 blinded clinical samples from 89 patients, positive by NAAT and culture (25 women, 64 men; 21 cervical, 3 vaginal, 1 urethral, 48 urine, 10 throat and 21 rectal).
Results Phase 1 and Phase 2: 61/81(75%) and 68/103(66%) respectively were phenotypically susceptible to ciprofloxacin; 81/81 and 87/103 respectively of S91P assays worked. Phase 2 assay failure was not associated with sample site. Of Phase 2 assays that worked, predictive values for identifying ciprofloxacin susceptible gonorrhoea, using wild-type (S91P absence), and resistant gonorrhoea, using S91P presence, on clinical samples from: genital sites was 100%(95% CI: 91%–100%)/86%(67%–95%) respectively; non-genital sites was 93%(68%–99%)/92%(65%–99%) respectively; overall was 98%(90%–100%)/88%(73%–95%) respectively. Among all 89 patients, assay use would have identified 47(53%) as treatable with ciprofloxacin, one incorrectly (predictive value of assay for susceptibility 97.9%(88.9%–99.6%). However, nearly 80% of men and 60% of women received treatment for gonorrhoea before these results would have been available.

Conclusions Direct genotypic testing of routine gonococcal NAAT-positive genital samples allows for safe use of ciprofloxacin in gonorrhoea but may have limited impact, particularly for men until available at the point of care.

P5.099 METRONIDAZOLE ANTIMICROBIAL DRUG RESISTANCE TESTING OF *TRICHOMONAS VAGINALIS* COLLECTED FROM WOMEN ATTENDING AN ANTI-RETROVIRAL CLINIC, PRETORIA, SOUTH AFRICA

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Background Nitroimidazoles, in particular metronidazole and tinidazole are used to treat anaerobic protozoa, which include *Trichomonas vaginalis*, *Giardia duodenalis* and *Entamoeba histolytica*. In South Africa information about metronidazole resistance of *T. vaginalis* isolates is limited. This pilot study aimed to determine the metronidazole antimicrobial drug resistance and genetic relatedness of *T. vaginalis* isolates obtained from women attending the anti-retroviral clinic at the Tshwane District Hospital, Pretoria.
Methods Self-collected vaginal swabs were collected from HIV positive women until 30 *T. vaginalis* positive samples were obtained. Metronidazole antimicrobial drug resistance of *T. vaginalis* isolates was determined *in vitro* by microdilution and microtitre methods. The strain relatedness was determined by the random amplified polymorphic DNA (RAPD) assay using five primers (TV1, TV2, TV3, TV5 and TV6). Dendrogrammes were constructed from the RAPD assay's fingerprinting data using GelCompar*II*.
Results Metronidazole resistance was detected in 6% (2/30) of the *T. vaginalis* isolates. The minimal inhibitory concentration (MIC) was between 0.06 µg/ml and 25 µg/ml. No correlation was observed between metronidazole resistance and a specific protozoal genetic cluster.
Conclusion A low prevalence of *T. vaginalis* metronidazole resistance was detected in the clinical setting. The MIC values are in agreement with those reported in literature. The two metronidazole resistant isolates are from genetically diverse backgrounds. It is important to monitor the changes in the MIC values of the circulating *T. vaginalis* protozoa to ensure that the syndromic management of trichomoniasis used in South Africa, is adequate.

P5.100 TRENDS IN THE ANTIMICROBIAL SUSCEPTIBILITY OF *NEISSERIA GONORRHOEAE* ISOLATES IN BELGIUM (2006–2011)

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Background Increased resistance of *Neisseria gonorrhoeae* to antimicrobials has been reported worldwide, jeopardising the treatment of gonorrhoea. In order to provide guidance in treatment guidelines a national gonococcal antimicrobial surveillance programme has been installed in Belgium. We present here the data collected from 2006 till 2011.
Methods All Belgian laboratories are asked to send *N. gonorrhoeae* strains isolated in their laboratories to the national reference laboratory where Minimal Inhibitory Concentrations (MIC) are determined using the agar dilution assay according to the Clinical and Laboratory Standard Institute (CLSI). The MICs for ceftriaxone (cef), spectinomycin (spe), ciprofloxacin (cip), azithromycin (azi), penicillin (pen), and tetracycline (tet) are determined. The MIC breakpoints recommended by CLSI are applied, except for azithromycin for which the breakpoints recommend by the Centers for Disease Control and prevention are used.
Results The following table summarises the antimicrobial resistance per year

Abstract P5.100 Table 1

Year	N	β lactamase	cef	spe	cip		azi	pen		tet	
		% present	% DS	% R	% I	% R	% R	% I	% R	% I	% R
2006	332	10.2	0.0	0.0	1.2	61.4	2.6	51.8	32.8	31.3	50.9
2007	484	10.3	0.0	0.0	0.0	60.3	3.1	49.6	34.7	30.6	49.0
2008	510	16.9	0.0	0.0	1.0	57.5	1.6	50.8	35.5	34.5	48.0
2009	522	18.2	0.0	0.0	3.8	63.2	2.1	44.6	47.7	27.8	61.5
2010	537	19.2	0.0	0.0	0.9	60.9	8.2	36.5	52.3	29.6	56.4
2011	501	11.4	0.0	0.0	1.2	57.1	2.6	54.9	36.3	32.7	55.5

R: resistance; I: intermediate susceptibility; DS: decreased susceptibility

Conclusions The current Belgian guidelines recommend ceftriaxone as first- and spectinomycin as second line treatment for gonorrhoea. Although a decreased susceptibility or resistance was not observed, shifts in MIC are closely followed up. In addition, alternatives for treatment have to be sought in the event of emerging resistance.

P5.101 RISING TREND OF ANTIMICROBIAL RESISTANCE AMONG NEISSERIA GONORRHOEAE ISOLATES IN A CENTRAL DELHI TERTIARY CARE HOSPITAL

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Background Gonorrhoea continues to be a common sexually transmitted disease (STD) in developing countries. Over the last decade, N.gonorrhoeae has developed resistance against antimicrobial agents such as penicillin, tetracycline and quinolones in several countries including India. Monitoring the antimicrobial susceptibility of gonococcal isolates is essential for early detection of antimicrobial resistance.
Methods In our STD laboratory, all gonococcal isolates are subjected to antimicrobial susceptibility testing by disc diffusion method as per CLSI guidelines. ß-lactamase production is determined by chromogenic cephalosporin test. Minimum Inhibitory Concentration (MIC) for ceftriaxone is determined by E-test. WHO reference strains are used for quality control. We regularly participate in an External quality assurance scheme (EQAS) - Gonococcal Antimicrobial Susceptibility Program (GASP) under WHO.
Results The number of cases of gonorrhoea and hence gonococcal isolates has declined in our hospital over the years. A significant increase in penicillinase producing N.gonorrhoeae (PPNG) has been observed. The percentage of PPNG increased from 8% in 1997 to13% in 2007 and 84.2% in 2011–2013. Quinolone resistant N.gonorrhoeae (QRNG) showed a significant increase from 12% in 1997 to 98.7% in 2007, while 89.47% isolates were found to be QRNG by 2011–2013. Although the percentage of tetracycline resistant N. gonorrhoeae (TRNG) has decreased over the years, overall percentage of isolates resistant to tetracycline increased. In January 2013 we detected our first gonococcal isolate with decreased susceptibility to third generation cephalosporins; Ceftriaxone, Cefixime and Cefpodoxime.
Conclusion The results of our study highlighted an alarming increase in the percentage of PPNG and QRNG strains over the last 16 years. Emergence of N.gonorrhoeae isolates with decreased susceptibility to third generation cephalosporins is a cause of concern. Thus continuous monitoring of antimicrobial susceptibility of all gonococcal strains circulating in a community should be performed to prevent treatment failures and further spread of resistant strains.