

Prevalence of genital and oropharyngeal chlamydia and gonorrhoea among female sex workers in Melbourne, Australia, 2015–2017: need for oropharyngeal testing

Eric PF Chow,^{1,2} Deborah A Williamson,³ Ria Fortune,² Catriona S Bradshaw,^{1,2} Marcus Y Chen,^{1,2} Glenda Fehler,² Vesna De Petra,³ Benjamin P Howden,³ Christopher K Fairley^{1,2}

¹Central Clinical School, Monash University, Melbourne, Victoria, Australia

²Melbourne Sexual Health Centre, Alfred Health, Carlton, Victoria, Australia

³Microbiological Diagnostic Unit Public Health Laboratory, Department of Microbiology and Immunology, The University of Melbourne at The Peter Doherty Institute for Infection and Immunity, Melbourne, Victoria, Australia

Correspondence to

Associate Professor Eric PF Chow, Melbourne Sexual Health Centre, Alfred Health, Carlton, VIC 3053, Australia; eric.chow@monash.edu

Received 23 December 2018

Revised 4 March 2019

Accepted 24 March 2019

Published Online First

21 May 2019



► <http://dx.doi.org/10.1136/sextrans-2018-053803>

► <http://dx.doi.org/10.1136/sextrans-2018-053911>

► <http://dx.doi.org/10.1136/sextrans-2019-054030>



Check for updates

© Author(s) (or their employer(s)) 2019. No commercial re-use. See rights and permissions. Published by BMJ.

To cite: Chow EPF, Williamson DA, Fortune R, et al. *Sex Transm Infect* 2019;**95**:398–401.

ABSTRACT

Objective The Victorian legislation requires sex workers to have quarterly screening for genital chlamydia and gonorrhoea, but screening for oropharyngeal infection is not mandatory in Victoria, Australia. In 2017, oropharyngeal screening for gonorrhoea and chlamydia was added as part of the routine quarterly screening for sex workers attending the Melbourne Sexual Health Centre (MSHC). The aim of this study was to examine the prevalence of oropharyngeal gonorrhoea and chlamydia among female sex workers (FSW).

Methods We included females who (1) self-identified as sex workers or were attended MSHC for a sex work certificate and (2) had tested for any STI or HIV, between March 2015 and December 2017. The prevalence of HIV, syphilis, chlamydia and gonorrhoea was calculated.

Results There were 8538 FSW consultations among 2780 individuals during the study period. There was a twofold increase in genital gonorrhoea (from 0.5% (95% CI 0.3% to 0.9%) to 1.1% (95% CI 0.8% to 1.5%); $p_{\text{trend}}=0.047$) and a 1.5-fold increase in genital chlamydia (from 2.2% (95% CI 1.6% to 2.8%) to 3.2% (95% CI 2.6% to 3.8%); $p_{\text{trend}}=0.031$) during the period. Overall, the prevalence of HIV (0.2% (95% CI 0.1% to 0.3%)) and syphilis (0.1% (95% CI 0.0% to 0.2%)) remained low and did not change over time. In 2017, the prevalence of oropharyngeal gonorrhoea was 2.0% (95% CI 1.6% to 2.6%) and oropharyngeal chlamydia was 2.1% (95% CI 1.6% to 2.7%). Among FSW who were tested positive for gonorrhoea and chlamydia, 55% (n=41) and 34% (n=45) only tested positive in the oropharynx but not genital for gonorrhoea and chlamydia, respectively.

Conclusion The prevalence of oropharyngeal gonorrhoea and chlamydia is similar to the prevalence at genital sites and is often independent of genital infection. It is important to test the oropharynx and genital site for chlamydia and gonorrhoea among FSW.

INTRODUCTION

The laws that govern sex work in Australia vary in different states and territories.¹ In Victoria, sex work is legal and regulated. Under the Sex Work Act (1994) and Sex Work Regulations (2006),

mandatory quarterly screening for HIV and other sexually transmitted infections (STIs) is required but the anatomical site of screening is not specified.² Sex workers who work in licensed brothels are required to provide their brothel manager with a certificate that indicates they have been tested for HIV/STI in the last 3 months.

Previous studies up to 2013 have shown that sex workers in Victoria have a low prevalence of HIV and bacterial STIs.² A national study has shown that there was a substantial increase in the incidence of gonorrhoea among Australian FSW from 2009 to 2015, and this increase occurred mainly at the oropharynx (from 1.6 to 4.9 per 100 person-year) but was not significant for genital gonorrhoea (from 1.0 to 1.7 per 100 person-year).³

As per the Australian STI screening guidelines, asymptomatic screening for oropharyngeal gonorrhoea is mainly recommended for gay and bisexual men who have sex with men (MSM) but is rarely performed in heterosexuals.⁴ The aim of this study was to explore the prevalence of oropharyngeal chlamydia and gonorrhoea and the proportion of oropharyngeal infections would have been missed by genital-only screening. Findings from this study could provide additional evidence in informing whether testing for oropharyngeal STI among FSW is needed.

METHOD

This was a cross-sectional data analysis of routinely collected clinical data among FSW attending the Melbourne Sexual Health Centre (MSHC), Victoria, Australia, between March 2015 and December 2017. We defined FSW as females who identified themselves as sex workers and/or attending MSHC for a sex work certificate. Demographic characteristics (eg, age, country of birth) and HIV/STI diagnoses data among FSW were extracted from patient electronic medical database.

Before 2017, all FSW were recommended for HIV, syphilis and genital gonorrhoea and chlamydia testing. Testing for oropharyngeal and anorectal gonorrhoea and/or chlamydia was only conducted on request of the FSW. However, some FSW were

tested for oropharyngeal gonorrhoea (15.0% (343/2282) in 2015 and 26.9% (803/2986) in 2016) or oropharyngeal chlamydia (0.2% (4/2282) in 2015 and 0.6% (17/2986) in 2016). Commencing January 2017, all FSW were also offered for oropharyngeal gonorrhoea and/or chlamydia testing in addition to genital testing. Oropharyngeal swabs were collected by clinicians for gonorrhoea and chlamydia testing. First-void urine or vaginal swabs were collected for genital testing for gonorrhoea and chlamydia. Oropharyngeal and genital specimens were tested by nucleic acid amplification test (NAAT) using the Aptima Combo 2 Assay (Hologic, California, USA) throughout the study. Data between 1 January and 22 March 2015 were excluded because our clinic changed the diagnostic test for chlamydia (from the less sensitive strand displacement assay (SDA) to the highly sensitive transcription-mediated assay (TMA) NAAT) and gonorrhoea (from culture to TMA NAAT).⁵

The annual prevalence of HIV/STI were calculated and its 95% CIs were calculated using the exact binomial distribution. χ^2 trend test was conducted to assess the trend of prevalence of HIV/STI between 2015 and 2017. Site-specific prevalence for gonorrhoea and chlamydia was also calculated among FSW attended MSHC in 2017.

All statistical analyses were conducted in Stata V.14.

RESULTS

There were 8538 FSW consultations included in this study (2282 in 2015, 2986 in 2016 and 3270 in 2017). The age of FSW ranged from 18 to 72 years, with a median age of 31 years (IQR 26 to 38 years). The three most frequent languages spoken at home were English (62%), Chinese (12%), Thai (6%) and Korean (6%).

The table 1 shows there was a twofold increase in genital gonorrhoea (from 0.5% (95% CI 0.3% to 0.9%) in 2015 to 1.1% (95% CI 0.8% to 1.5%) in 2017; $p_{\text{trend}}=0.047$) and a 1.5-fold increase in genital chlamydia (from 2.1% (95% CI 1.6% to 2.8%) to 3.2% (95% CI 2.6% to 3.8%); $p_{\text{trend}}=0.031$). However, the overall prevalence of HIV (0.2% (95% CI 0.1% to 0.3%)) and syphilis (0.1% (95% CI 0.0% to 0.2%)) remained low and did not change over time.

Testing for oropharyngeal gonorrhoea and chlamydia was introduced in 2017, the prevalence of oropharyngeal gonorrhoea was 2.0% (95% CI 1.6% to 2.6%) and oropharyngeal chlamydia was 2.1% (95% CI 1.6% to 2.7%).

In 2017, there were 93 gonorrhoea diagnoses among 80 FSW; 63% (n=59) were oropharyngeal infections and 37% (n=34) were genital infections. Among 80 FSW who were diagnosed with gonorrhoea, 74 FSW were tested for gonorrhoea at both genital sites and the oropharynx, and half of them (55% (95% CI 43% to 67%); 41/74) tested positive in the oropharynx but negative in genital specimens, 27% (95% CI 17% to 39%; 20/74) tested positive in genital specimens but negative in the oropharynx and 18% (95% CI 10% to 28%; 13/74) tested positive at both sites (figure 1A).

There were 159 chlamydia diagnoses among 147 FSW; 38% (n=61) were oropharyngeal infections and 62% (n=98) were genital infections. Among 147 FSW who were diagnosed with chlamydia, 131 FSW were tested for chlamydia at both genital sites and the oropharynx, and 34% (95% CI 26% to 43%; 45/131) tested positive in the oropharynx but negative in genital specimens, 56% (95% CI 48% to 65%; 74/131) tested positive in genital specimens but negative in the oropharynx and 9% (95% CI 5% to 15%; 12/131) tested positive at both sites (figure 1B).

Table 1 Demographic characteristics and HIV/STI prevalence among female sex workers attending Melbourne Sexual Health Centre, 2015–2017.

	Year			P _{trend}
	2015*	2016	2017	
Number of consultations	2282	2986	3270	–
Number of individuals	1297	1503	1641	–
Demographic characteristics†				
Age, mean±SD	32.7±8.5	32.3±8.6	32.2±8.8	0.111
Country of birth, n (%)				
Australia	491 (37.9%)	605 (40.3%)	672 (41.0%)	0.347
Overseas	739 (57.0%)	812 (54.0%)	890 (54.2%)	
Unknown	67 (5.2%)	86 (5.7%)	79 (4.8%)	
Language spoken at home, n (%)				
English	806 (62.1%)	952 (63.3%)	1010 (61.5%)	0.007
Chinese	134 (10.3%)	150 (10.0%)	235 (14.3%)	
Thai	92 (7.1%)	91 (6.1%)	83 (5.1%)	
Korean	79 (6.1%)	88 (5.9%)	89 (5.4%)	
Other	103 (7.9%)	127 (8.4%)	139 (8.5%)	
Unknown	83 (6.4%)	95 (6.3%)	85 (5.2%)	
HIV/STI prevalence, n/N (%)‡				
Genital gonorrhoea	11/2157 (0.5%)	33/2830 (1.2%)	34/3094 (1.1%)	0.047
Genital chlamydia	47/2190 (2.1%)	82/2850 (2.9%)	98/3104 (3.2%)	0.031
Oropharyngeal gonorrhoea	–	–	59/2883 (2.0%)	–
Oropharyngeal chlamydia	–	–	61/2878 (2.1%)	–
HIV	3/2147 (0.1%)	3/2763 (0.1%)	7/3027 (0.2%)	0.375
Syphilis	4/2143 (0.2%)	1/2763 (0.2%)	3/3028 (0.1%)	0.403

*Only included data from the 23 March to 31 December 2015.

†Age, country of birth and language spoken at home were calculated based on the number of individuals per year. Independent samples t-test was used to assess the difference of mean age over the study period. χ^2 test was used to assess the difference of country of birth over the study period.

‡HIV and STI prevalence was calculated based on the number of consultations per year. χ^2 trend test was used to assess the trend of HIV/STI prevalence over the study period. N represents the number of tests performed and n represents the number of tests tested positive by nucleic acid amplification test using the Aptima Combo 2 Assay (Hologic, California, USA).

DISCUSSION

The prevalence of genital gonorrhoea and chlamydia has increased a 1.5-fold to twofold between 2015 and 2017 among FSW attending a sexual health clinic in Melbourne, Australia. However, the prevalence of HIV and syphilis remained low and did not change over time. Oropharyngeal gonorrhoea was more common than genital gonorrhoea in FSW. The prevalence of oropharyngeal gonorrhoea among FSW (2%) is relatively low compared with FSW in other settings such as Tel-Aviv (9%),⁶ Singapore (5%)⁷ and Hong Kong (4%).⁸ Similarly, the prevalence of oropharyngeal chlamydia among FSW in this study (2%) was also relatively low compared with FSW in Hong Kong (3%).⁸ However, the prevalence of oropharyngeal gonorrhoea and chlamydia among FSW in our study is consistent with the findings among FSW in the Netherlands where sex work is legal (ie, 2% for both oropharyngeal infections).⁹ One thing in common for both gonorrhoea and chlamydia is that most of the FSW did not have multiple sites of infections; this suggests genital-only testing

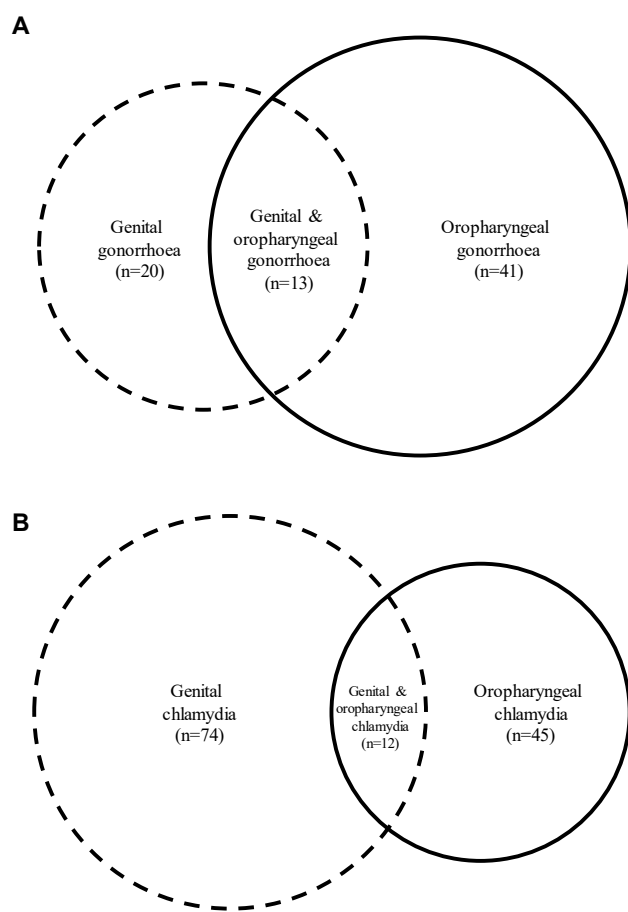


Figure 1 Number of (A) gonorrhoea and (B) chlamydia infections among female sex workers, stratified by anatomical sites.

for chlamydia and gonorrhoea will have missed a substantial proportion of oropharyngeal cases.

The increase in gonorrhoea in FSW reflects the increase in gonorrhoea in Victoria as a whole—a 1.5-fold rise in notifications of gonorrhoea in Victoria (from 4898 in 2015 to 7344 in 2017) and is also similar to the rise in gonorrhoea observed in females who are not sex workers.¹⁰ While the reasons for these rises in gonorrhoea are not clear, the similarity between the rise in gonorrhoea in FSW and the rise in the general population suggest that the rise in FSW may reflect a rise across the broader heterosexual population.

Our study found that multisite infection is 18% for gonorrhoea and 9% for chlamydia among FSW. Wong *et al* reported only 6% had gonorrhoea and 7% had chlamydia at both oropharynx and genital site among FSW in Hong Kong.⁸ It is important to note that 34% (ie, 45 cases) and 55% (ie, 41 cases) tested positive in the oropharynx but negative in the genital site for chlamydia and gonorrhoea, respectively. This suggests more than half of gonorrhoea infections and one-third of chlamydia infections would have been missed by genital-only testing among FSW, suggesting testing for oropharyngeal STI as part of HIV/STI testing among FSW is important.

We found gonorrhoea is more commonly detected in the oropharynx than in the genital site (2.0% vs 1.1%; $p=0.005$) among FSW in Melbourne and this is consistent with other international studies conducted in the Netherlands (oropharynx: 2.0% and genital: 1.7%)⁹ and Hong Kong (oropharynx: 4.4%

and genital: 0.9%).⁸ This contrasts with chlamydia epidemiology as we found genital chlamydia is more common than oropharyngeal chlamydia (3.2% vs 2.1%; $p=0.013$) and again this is also consistent with findings in the Netherlands (oropharynx: 2.0% and genital: 6.0%)⁹ and Hong Kong (oropharynx: 3.2% and genital: 10.6%).⁸ The reason why gonorrhoea is more common in the oropharynx than genital sites among FSW still remains unclear. It has been suggested that condomless fellatio is a risk factor for oropharyngeal gonorrhoea. However, past studies in Sydney and Hong Kong found there is no significant association between condomless fellatio and oropharyngeal gonorrhoea diagnosis among FSW.^{8, 11} In addition, consistent condom use for fellatio between FSW and their male clients at work has been increased over time in Australia and is relatively high in recent years (ie, consistent condom use for fellatio in the last 3 months increased from 40% in 1993 to 66% in 2003 then to 75% in 2009 among FSW in Sydney).^{11, 12} Recent studies have suggested that kissing may also be a risk factor for oropharyngeal gonorrhoea in gay and bisexual men who have sex with men (MSM),^{13–16} but there has been no epidemiological research confirming whether kissing is a risk factor for oropharyngeal gonorrhoea among FSW. In addition, kissing practice among FSW is rarely studied. The latest Australian study on kissing among FSW was conducted in the 1980s, and the authors found that kissing between FSW and their clients were less common (ie, 27%)¹⁷; however, this estimate would have been biased as the study was conducted during the HIV/AIDS epidemic where the mode of HIV transmission was still unclear and the fear of HIV transmission from kissing during that period.¹⁸ Safe sex and harm reduction messages on oral sex have been recommended to FSW that condoms should be used during oral sex and gargling with mouthwash after providing fellatio,¹⁹ but, to date, there has been no study estimating how common FSW would gargle mouthwash after providing fellatio. There have been limited studies examining whether mouthwash can clear gonorrhoea infection in the oropharynx,²⁰ and an Australian clinical trial is currently underway exploring whether gargling mouthwash daily could prevent oropharyngeal gonorrhoea.²¹

The rise in the prevalence of gonorrhoea in female sex workers should not prompt calls for increasing screening. Screening is very expensive and has not been shown in any study is sex workers to reduce the prevalence of HIV/STI. A mathematical model determined that monthly screening for chlamydia, for example, cost over US\$90 000 for each chlamydia infection averted and over US\$600 000 in screening costs for each quality-adjusted life year saved.²² This model appropriately led to the changes in mandatory testing for gonorrhoea and chlamydia from monthly to quarterly in 2012.² What our study does show, however, if testing is to be done, then the oropharynx should be included as a site for testing.

This study has several limitations. First, this study was conducted at a single urban sexual health clinic in Melbourne that may not be representative of the whole FSW population in Victoria. Our findings may only be relevant to settings that have sex work legislation and regulation as in Victoria, and thus it may not be generalisable to other settings where sex work is illegal, or sex work legislation is not in place. Second, the number of male clients was not collected as part of the routine clinical care and management. From our previous experience, most FSW declined to report the number of male clients as they considered this is a proxy of the income they earn. Third, sexual practices with the male clients were not collected, and hence we were unable to investigate the risk factors for HIV and STI in this study.

In summary, the prevalence of HIV and syphilis remains low and stable but there has been an increase in genital gonorrhoea and chlamydia among FSW in Melbourne between 2015 and 2017. Gonorrhoea is more common in the oropharynx than in the genital and infection at both sites is uncommon. This indicates that a significant proportion of oropharyngeal infections would have been missed by genital-only testing. It is therefore important to recommend testing for oropharyngeal gonorrhoea and chlamydia among FSW as part of HIV/STI testing regardless the sexual practices.

Key messages

- Genital gonorrhoea and chlamydia prevalence among female sex workers in Melbourne have increased 1.5-fold to twofold between 2015 and 2017, but HIV and syphilis prevalence was low and stable.
- Gonorrhoea prevalence is more common in the oropharynx than the genital site among female sex workers.
- Genital-only testing would have missed half of gonorrhoea infections and one-third of chlamydia infections among female sex workers.
- It is important to test the oropharynx and genital site for both chlamydia and gonorrhoea among female sex workers.

Handling editor Professor Jackie A Cassell

Twitter Follow Eric Chow @EricPFChow

Acknowledgements The authors would like to acknowledge Afrizal Afrizal for his assistance with data extraction.

Contributors EPFC and CKF conceived and developed the study. EPFC performed the data analysis and wrote the first draft of the manuscript. DAW, GF, VDP and BJH provided guidance on the aspects of laboratory testings. All authors were involved in data interpretation. All authors revised the manuscript critically for important intellectual content and approved the final version.

Funding EPFC and DAW are supported by the National Health and Medical Research Council (NHMRC) Early Career Fellowships (1091226 and 1123854, respectively). BPH is supported by an NHMRC Practitioner Fellowship (1105905).

Competing interests None declared

Patient consent for publication Not required.

Ethics approval Ethics approval for this study was obtained by the Alfred Hospital Ethics Committee, Melbourne, Australia (number 330/17).

Provenance and peer review Not commissioned; externally peer reviewed.

REFERENCES

- 1 Harcourt C, Egger S, Donovan B. Sex work and the law. *Sex Health* 2005;2:121–8.
- 2 Chow EPF, Fehler G, Chen MY, *et al.* Testing commercial sex workers for sexually transmitted infections in Victoria, Australia: an evaluation of the impact of reducing the frequency of testing. *PLoS One* 2014;9:e103081.
- 3 Callander D, McManus H, Guy R, *et al.* Rising Chlamydia and gonorrhoea incidence and associated risk factors among female sex workers in Australia: a retrospective cohort study. *Sex Transm Dis* 2018;45:199–206.
- 4 Australasian Sexual Health Alliance (ASHA). Australian STI management guidelines for use in primary care Sydney, Australia, 2018. Available: <http://www.sti.guidelines.org.au/> [Accessed 21 Oct 2018].
- 5 Cornelisse VJ, Chow EPF, Huffam S, *et al.* Increased detection of pharyngeal and rectal gonorrhea in men who have sex with men after transition from culture to nucleic acid amplification testing. *Sex Transm Dis* 2017;44:114–7.
- 6 Linhart Y, Shohat T, Amitai Z, *et al.* Sexually transmitted infections among brothel-based sex workers in Tel-Aviv area, Israel: high prevalence of pharyngeal gonorrhoea. *Int J STD AIDS* 2008;19:656–9.
- 7 Wong ML, Chan RK. A prospective study of pharyngeal gonorrhoea and inconsistent condom use for oral sex among female brothel-based sex workers in Singapore. *Int J STD AIDS* 1999;10:595–9.
- 8 Wong HTH, Lee KCK, Chan DPC. Community-based sexually transmitted infection screening and increased detection of pharyngeal and urogenital Chlamydia trachomatis and Neisseria gonorrhoeae infections in female sex workers in Hong Kong. *Sex Transm Dis* 2015;42:185–91.
- 9 Verscheijden MMA, Woestenberg PJ, Götz HM, *et al.* Sexually transmitted infections among female sex workers tested at STI clinics in the Netherlands, 2006–2013. *Emerg Themes Epidemiol* 2015;12.
- 10 Misson J, Chow EPF, Chen MY, *et al.* Trends in gonorrhoea infection and overseas sexual contacts among females attending a sexual health centre in Melbourne, Australia, 2008–2015. *Communicable Diseases Intelligence* 2018;42:1–10.
- 11 Read PJ, Wand H, Guy R, *et al.* Unprotected fellatio between female sex workers and their clients in Sydney, Australia. *Sex Transm Infect* 2012;88:581–4.
- 12 Pell C, Dabbhadatta J, Harcourt C, *et al.* Demographic, migration status, and work-related changes in Asian female sex workers surveyed in Sydney, 1993 and 2003. *Aust N Z J Public Health* 2006;30:157–62.
- 13 Chow EPF, Cornelisse VJ, Williamson DA, *et al.* Kissing may be an important and neglected risk factor for oropharyngeal gonorrhoea: a cross-sectional study in men who have sex with men. *Sex Transm Infect* 2019;10.1136/sextrans-2018-053896.
- 14 Cornelisse VJ, Walker S, Phillips T, *et al.* Risk factors for oropharyngeal gonorrhoea in men who have sex with men: an age-matched case-control study. *Sex Transm Infect* 2018;94:359–64.
- 15 Fairley CK, Hocking JS, Zhang L, *et al.* Frequent transmission of gonorrhea in men who have sex with men. *Emerg Infect Dis* 2017;23:102–4.
- 16 Cornelisse VJ, Williamson D, Zhang L, *et al.* Evidence for a new paradigm of gonorrhoea transmission: cross-sectional analysis of *Neisseria gonorrhoeae* infections by anatomical site in both partners in 60 male couples. *Sex Transm Infect* 2019;95:437–42.
- 17 Perkins R. Prostitutes Working Girls. *Their life and social control*. 467. Canberra: Australian Institute of Criminology, 1991.
- 18 Nutbeam D, Catford JC, Smail SA, *et al.* Public knowledge and attitudes to AIDS. *Public Health* 1989;103:205–11.
- 19 Rekart ML. Sex-work harm reduction. *Lancet* 2005;366:2123–34.
- 20 Chow EP, Howden BP, Walker S, *et al.* Antiseptic mouthwash against pharyngeal *Neisseria gonorrhoeae*: a randomised controlled trial and an in vitro study. *Sex Transm Infect* 2017;93:88–93.
- 21 Chow EPF, Walker S, Hocking JS, *et al.* A multicentre double-blind randomised controlled trial evaluating the efficacy of daily use of antibacterial mouthwash against oropharyngeal gonorrhoea among men who have sex with men: the omega (oral mouthwash use to eradicate gonorrhoea) study protocol. *BMC Infect Dis* 2017;17:456.
- 22 Wilson DP, Heymer K-J, Anderson J, *et al.* Sex workers can be screened too often: a cost-effectiveness analysis in Victoria, Australia. *Sex Transm Infect* 2010;86:117–25.