Understanding risk factors for oropharyngeal gonorrhoea among sex workers attending sexual health clinics in two Australian cities: a mixed methods study

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Abstract

Background: The risk factors for oropharyngeal gonorrhoea have not been examined in sex workers, despite the increasing prevalence of gonorrhoea infection.

Objective: This study aimed to determine the risk factors for oropharyngeal gonorrhoea in female and gender diverse sex workers (SWs) (including cisgender and transgender women) and gender diverse sex workers (including non-binary, gender fluid or those with a different identity), and examine kissing, oral sex, and mouthwash practices with clients.

Methods: This mixed methods case-control study was conducted from 2018-2020 at two sexual health clinics in Melbourne and Sydney. We recruited 83 SWs diagnosed with oropharyngeal gonorrhoea (cases) and 581 SWs without (controls). Semi-structured interviews with 19 SWs from Melbourne were conducted.

Results: In the case-control study, the median age of 664 SWs was 30 years (IQR: 25-36). Performing condomless fellatio with clients was the only behaviour associated with oropharyngeal gonorrhoea (adjusted odds ratio[aOR]: 3.6; 95%CI: 1.7-7.6; P=0.001). The majority of participants used mouthwash frequently (521; 78.5%). In the qualitative study, almost all SW reported kissing clients due to demand and generally reported following clients' lead with kissing style and duration. However, they used condoms for fellatio because they considered it a risky practice for contracting STIs, unlike cunnilingus without a dental dam. Almost 30% of SW reported performing some condomless fellatio on clients and this practice was associated with oropharyngeal gonorrhoea diagnosis.

Conclusions: Our study shows that condomless fellatio is a risk-factor for oropharyngeal gonorrhoea among FSWs, and that future research is warranted into the role of mouthwash use in relation to gonorrhoea transmission given the high rates of use in this population Clinical Trial: n/a

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Understanding risk factors for oropharyngeal gonorrhoea among sex workers attending sexual health clinics in two Australian cities: a mixed methods study

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Abstract

Background: The risk factors for oropharyngeal gonorrhoea have not been examined in sex workers, despite the increasing prevalence of gonorrhoea infection.

Objectives: This study aimed to determine the risk factors for oropharyngeal gonorrhoea in female and gender diverse sex workers (SWs) (including cisgender and transgender women) and gender diverse sex workers (including non-binary, gender fluid or those with a different identity), and examine kissing, oral sex, and mouthwash practices with clients.

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Results: In the case-control study, the median age of 664 SWs was 30 years (IQR: 25-36). Almost 30% of SW reported performing some condomless fellatio on clients. Performing condomless fellatio with clients was the only behaviour associated with oropharyngeal gonorrhoea (adjusted odds ratio[aOR]: 3.6; 95%CI: 1.7-7.6; *P*=0.001). The majority of participants used mouthwash frequently (521; 78.5%). In the qualitative study, almost all SW reported kissing clients due to demand and generally reported following clients' lead with kissing style and duration. However, they used condoms for fellatio because they considered it a risky practice for contracting STIs, unlike cunnilingus without a dental dam.

Conclusions: Our study shows that condomless fellatio is a risk factor for oropharyngeal gonorrhoea among SWs despite most SWs using condoms with their clients for fellatio. Novel interventions, particularly targeting the oropharynx, will be required for oropharyngeal gonorrhoea prevention.

Keywords: Case-control; qualitative; oral sex; condoms; transactional sex

Introduction

There has been an increase in gonorrhoea incidence in several countries over the past decade[1-3], which is of particular concern given increasing antimicrobial resistance (AMR)[4, 5]. The oropharynx has been implicated in *Neisseria gonorrhoeae* transmission, possibly through saliva exchanged during oral sex practices and tongue kissing[6-9]. The oropharynx is considered a crucial site for AMR given difficulties in treating oropharyngeal gonorrhoea and the increased propensity for *N. gonorrhoeae* to develop resistance in the oropharynx than at other anatomical sites[4, 10, 11]. Sex workers have been identified as an important priority population which bears a disproportionate burden of gonorrhoea globally, yet data on the prevalence of oropharyngeal gonorrhoea in this population are sparse[12]. There is, therefore, an urgent need for research into the risk factors for oropharyngeal gonorrhoea, particularly among sex workers, given its importance in AMR [13]. In 2017 an Australian study of female sex workers (FSWs) attending a sexual health clinic in Melbourne found that FSWs had a higher prevalence of oropharyngeal gonorrhoea (2%) than genital gonorrhoea (1%)[14]. That study also found that oropharyngeal infection was often independent of genital infection[14]. A retrospective study of 42 Australian sexual health clinics showed a 200% increase in oropharyngeal gonorrhoea among FSWs from 2009 to 2015[15]. Among gay, bisexual and other men who have sex with men (MSM), a case-control study found that oropharyngeal gonorrhoea was associated with the number of kissing and receptive fellatio casual sex partners in the preceding three months [9]. Due to the overlapping nature of tongue kissing and oral sex practices, it was not possible to undertake an adjusted analysis to determine the risk for any one practice in isolation for the transmission of oropharyngeal gonorrhoea[9]. There has been no similar case-control study study done, to our knowledge, to identify risk factors for oropharyngeal gonorrhoea in SWs.

A 2018 study of 180 FSWs attending a sexual health clinic in Melbourne, Australia, found that 149 (83.7%) tongue kissed and 175 (97.2%) performed fellatio on at least one male client in an average working week[16]. In addition to the lack of data on risk factors for oropharyngeal gonorrhoea among SWs, there is a lack of qualitative data exploring how SWs decide whether or not to engage in tongue kissing and oral sex practices (i.e. cunnilingus, fellatio) with male clients. There has been considerable research indicating an increased demand by male clients of female sex workers for the “girlfriend experience” (GFE), wherein sex workers and clients engage in sexual practices typical of those in intimate, non-commercial relationships (e.g. kissing and cunnilingus)[17, 18]. Research on the GFE tends to focus on the male clients who seek this interaction rather than on the SWs who provide the service, with no studies exploring the decision to provide these services. A Finnish qualitative study (2008) explored sexual pleasure among FSWs, a factor very rarely considered in the literature[19]. The study found that while sex work sometimes required mental distancing or disengagement from the work, which decreases sexual pleasure, the work may empower women by giving them control over the sexual experience and enhancing their own pleasure. No study to our knowledge has explored which factors, including pleasure, may influence the decision of SWs to engage in kissing and oral sex practices with clients.

Since the mid-2010s, the role of mouthwash has been and continues to be investigated as a novel intervention for gonorrhoea prevention in at-risk populations such as MSM[20-23]. Using mouthwash as a means for harm reduction has been previously recommended for SWs to reduce sexually transmissible infections (STI)[24] and a Melbourne-based study has shown that 83% of FSWs reported using mouthwash daily or weekly[16]. It is unclear, however, why SWs used mouthwash, be it driven by hygiene or a desire to reduce STI transmission, though recent research has shown that Listerine use does not reduce reinfection with gonorrhoea[22, 23]. In the event that

recommendations are made incorporating mouthwash into an STI prevention strategy for SWs, it would be beneficial to better understand what is driving mouthwash use among SWs.

The primary aim of this study was to identify the risk factors for oropharyngeal gonorrhoea among SWs (including female and non-binary sex workers) using a case-control study design. The secondary aim was to explore why SW engage in tongue kissing, oral sex, and use mouthwash using a qualitative approach.

Methods

Study design

The Health Research in Sex Workers (HERS) study was a mixed methods study comprising an unmatched case-control study and semi-structured interviews (supplemental figure 1). Topics from the quantitative data were expanded on and explored in more detail in the semi-structured interviews. Interviews were conducted simultaneously with the case-control survey and sought to clarify how and why SW may engage in oral sex practices involving saliva with clients.

Study Setting

The HERS case-control study was conducted at two sexual health clinics in Australia: (1) Melbourne Sexual Health Centre (MSHC) in Melbourne, Victoria and (2) the Thai and Chinese Clinics at Sydney Sexual Health Centre (SSHC) in Sydney, New South Wales (NSW). Participants were recruited for the case-control study at MSHC from November 2018 to March 2020 and at SSHC from November 2018 to December 2019. Both recruitment sites are large public sexual health clinics providing free sexual health services in inner urban settings. Sex work in Australia varies in legality by jurisdictions[25]. At the time of writing (January 2022), sex work was regulated by the Sex Work Act 1994 in Victoria,[26] which included the criminalisation of all sexual activities that include oral, vaginal, or anal penetration without a condom. In the state of New South Wales (NSW), sex work is decriminalized and there is no legislation criminalising condomless sex, and risk is managed through Work Health and Safety legislation. High rates of condom use among FSWs with male clients in both states have previously been reported, including >90% and >78% consistent use for vaginal sex and fellatio in an average working week, respectively[16, 27-29].

During the study period, sex workers were required by law to receive mandatory HIV/STI testing every three months in Victoria[30]. There is no mandatory HIV/STI testing in NSW, rather STI testing frequency recommendations are based on individual risk, as per the Australian STI Management Guidelines[31].

Participants for the qualitative study were recruited from MSHC from March 2019 to January 2020. Participants were unable to be recruited from SSHC due to practical constraints, as the interview team was based in Melbourne.

Female sex workers (cis and trans), and sex workers who selected a different identity who were assigned male at birth, were aged 18 and older, attended either clinic during the study period, and were working in the sex industry at the time of consultation were eligible for the HERS case-control study and those English speaking who attended MSHC were also eligible for the semi-structured interviews.

Case-control study

Participants,

SWs attending MSHC and SSHC for STI screening had a clinician-collected oropharyngeal swab to test for *N. gonorrhoeae*. Cases were defined as SWs with a positive oropharyngeal swab for gonorrhoea and controls were SWs who had a negative oropharyngeal swab for gonorhhoea.

Recruitment

Eligible and interested SWs attending MSHC or the Thai and Chinese Clinic at SSHC were given a paper-based questionnaire with a pre-labelled study ID by the recruiting clinicians. Additionally, SWs attending either clinic for treatment of oropharyngeal gonorrhoea were approached by a research nurse if they had not already completed the questionnaire and asked if they would like to participate in the study. In this way, cases were purposively recruited.

Data Collection

The questionnaire was designed by the study investigators with feedback sought from organisations that provide services for sex workers (Resourcing Health & Education, and the Sex Workers Outreach Project, both services for sex workers in Victoria and NSW, respectively). The questionnaire was offered in English, Thai, and Chinese at both recruiting sites (translated by a professional translation company but checked for readability by bilingual clinicians). Participant's unique patient identifier was recorded on a separate log with the corresponding questionnaire study ID. This log was collected daily by the research staff. Consent was implied by questionnaires being returned completed. No payment was given to participants for returning the questionnaire.

The HERS case-control quantitative questionnaire collected data on demographic characteristics (e.g. age, sex, country of birth, length of time in Australia and languages spoken at home), mouthwash practices, location of sex work, sex practices performed with male clients in an average working week, and sex practices with non-commerical male sexual partners in the previous seven days. Sex practices with female partners were not ascertained given the majority of clients are male and the risk for gonorrhoea among women who have sex with women are lower than those who have sex with men[32]. Sex practices included tongue kissing, oral sex (fellatio with and without ejaculation and cunnilingus), vaginal sex, anal sex, sex involving toys, and using saliva (either theirs or a partner's) as lubricant during sex (vaginal, anal and sex involving toys).

Gonorrhoea was diagnosed by using nucleic acid amplification tests (NAAT) performed on the Aptima Combo 2 Assay (Hologic, Marlborough, Massachusetts, USA) at MSHC and by Roche Cobas CT/NG assay (Roche Diagnostics, Mannheim, Germany) at SSHC. Aptima and Roche assays have similar sensitivity and specificity for oropharyngeal gonorrhoea detection[33]. Returned questionnaires were linked (via the questionnaire Study ID) to the patient identifier number recorded in the log by research staff in order to match their oropharyngeal gonorrhoea test results with their questionnaire data.

Study size

Sample size was calculated using OpenEpi[34] using the estimate that 25% of FSWs have condomless fellatio[35] and an assumed minimum risk factor prevalence of 25% in controls and a minimum odds ratio of 2. It should be noted that our original aim was to conduct a 1:4 age-matched case-control study which would have required 92 cases to 366 controls assuming the same parameters. However, due to the COVID-19 pandemic, recruitment had to be terminated before 92

cases were recruited given all sex work was required by law to cease during COVID-19 lockdown nationally (beginning 25th March 2020 in Australia)[36] and because sex practices with clients (and thus risk factors for oropharyngeal gonorrhoea) might have changed during the pandemic after sex work resumed. For an unmatched case-control study with a ratio of 1:7 cases to controls, at 80% power and a 0.05 significance, there needed to be 83 cases to 579 controls. There were 83 cases and 581 controls recruited before the COVID-19 lockdown, thus we were able to conduct an unmatched analysis with an 80% power to detect a difference using the significance level of 5%.

This study was reported as per the STROBE (Strengthening the Reporting of Observational Studies in Epidemiology) 2008 guidelines for case-control studies.

Statistical methods

Descriptive statistics were conducted to calculate the median age of participants. The median number of years in Australia for those born overseas was calculated and participants were categorised as newly-arrived or not based on whether they were in Australia less than or equal to the median or in Australia for greater than the median number of years. Median was calculated for number of male clients seen in an average working week. Mann Whitney U test was used to compare the differences between continuous variables between cases and controls. A Chi-squared test was used to compare differences in the proportion of categorical variables, and those declining to report were excluded from the Chi-squared analysis.

Univariable and multivariable unconditional logistic regression was performed to identify (1) the factors associated with declining to report sexual practice; and (2) the factors associated with oropharyngeal gonorrhoea. There were some differences in patient characteristics between MSHC and SSHC so we adjusted for site of recruitment in the logistic regression. Odds ratios (ORs) and the corresponding 95% confidence intervals (CI) were reported. Variables that were $p<0.1$ in the univariable analyses were included in the multivariable analyses. Given the different assays for gonorrhoea detection used between MSHC and SSHC, the site of recruitment was adjusted in the multivariable logistic regression for associations with oropharyngeal gonorrhoea. All statistical analyses were performed using Stata (version 14, Stata Corporation, College Station, TX, US).

Qualitative study

A Qualitative Descriptive approach was used for the qualitative study component. Qualitative Description is a pragmatic rather than theory driven approach which aims to provide a description of participants' views and experiences rather than an interpretive, theory driven analysis[37]. This approach is commonly used in healthcare when there are specific questions of clinical interest the study seeks to answer[37].

Participants

SW attending MSHC who completed a HERS English language version questionnaire for the case-control study were eligible for the semi-structured interviews.

Recruitment

During the recruitment period, participants at MSHC were shown an invitation at the end of the English language version of the quantitative HERS questionnaire, inviting them to participate in a one-on-one semi-structured interview on the topics covered in the questionnaire. All participants who selected "yes" to participating in the interviews were contacted by SMS (from their phone numbers

listed on their medical record at MSHC) and interviews were arranged either face-to-face or over the phone with those still wanting to participate, according to participant preference. Written or verbal (if interview was conducted by phone) informed consent was obtained from participants after the study information was discussed with them.

Data collection

The interview schedule was designed by the research team at MSHC and then reviewed by ACON Research Ethics Review Committee and SWOP (Sex Workers Outreach Project) in NSW and by RhED (Resourcing Health & Education), a service for sex workers in Victoria.
The interview schedule contained questions around sexual practices they performed at work that involved saliva exchange (either theirs or the clients') as well as their use of mouthwash at work. The interview schedule was based on the case-control survey questions, allowing for further exploration and depth of understanding around oral sex practices that involve saliva (specifically, adding depth to the data in terms of 'what', 'how' and 'why' for these practices). Participants were given a $50 AUD gift voucher after the completion of their interview (either in person or by mail in an unmarked envelope) to reimburse them for their time. All the interviews were audio recorded with the participant's permission and transcribed verbatim. Transcripts were de-identified. Audio files and transcripts were stored on secure servers and will be destroyed after 7 years in line with Alfred Health Ethics requirements.

Interviews were conducted in English by one of two researchers (TRP and KM), both of whom have experience with conducting interviews on sensitive sexual health issues. TRP sat in on the first two interviews conducted by KM and the two researchers reviewed and discussed the interviews afterwards to ensure consistency in the approach to the interviews. TRP and KM met weekly to discuss the interviews, the interview schedule and the developing themes. Upon completion of 12 interviews, the wider qualitative research team members (TRP, KM and JB) met to discuss the data, the developing themes and any further lines of questioning required.. At this point, one additional question was added to the interview schedule to further explore a topic that some participants had touched on in the interviews. The new question concerned hypothetical willingness to change sexual practices at work if saliva is shown to transmit gonorrhoea.

Nineteen interviews had been completed when participant recruitment was interrupted by the COVID-19 pandemic. The research team met to discuss preliminary findings; it was decided that recruitment would not continue in late 2020 and 2021 due to the likely differing sex practices and risk perceptions with regards to COVID-19 as well as the ongoing COVID-19 lockdowns and restrictions causing continued disruptions in sex work and research in Australia.

According to Braun and Clarke, the concept of data saturation and its meaning and use depends on the purpose and goals of a study and the data analysis approach being utilized[38]. While Braun and Clarke argue data saturation is not the best rationale for sample size, particularly when using a reflective thematic data analysis approach, when studies are conducted for largely pragmatic reasons, follow a fairly structured deductive approach to data analysis in which the data generated are relatively concrete, participants are largely recruited from a particular setting, coding largely relates to the broad topics or interview questions, and themes act largely as a summary of participants differing responses, with little further interpretation around meaning, the concept data saturation or the point at which no 'new' insights are provided, may be useful[38]. Given the deductive nature of the analysis and that the themes were largely guided by the research questions, the concept of data saturation was applied, with themes saturated among a broad sample with a range of ages, years working in the sex industry and experiences within the context of brothel-based sex work in Melbourne. Further insight into two particular groups of SW's however, would have been beneficial

and offered further insight including those who worked outside of brothels, or who were cases (diagnosed with oropharyngeal gonorrhoea at time of recruitment). For pragmatic reasons previously outlined (recruitment had to cease due to COVID-19), this was not possible.

Data Analysis

Data were analysed using deductive thematic analysis, a 'top down' approach wherein coding and analysis is largely informed by the ideas and concepts the researcher brings to the data, rather than being created from the data itself. In the case of this study, coding and themes were largely guided by the interview schedule questions and topics which had been informed by literature in the field and the specific questions of clinical interest the research team sought to answer [39]. Each transcript was initially read and coded by TRP. After all transcripts were coded, the transcripts were imported into N-Vivo (version 12) for data management. The codes were grouped and labelled into preliminary themes before each transcript was read again and the themes were further revised, refined and compared for similarities and differences. A subset of transcripts was read and coded by JB and KM after which all three researchers (TRP, JB, KM) met to discuss and reach a final consensus on the themes. There were no major differences in interpretation evident.

This manuscript is reported as per the RATS Guidelines for qualitative research[40].

Ethics and Community Review

This study was approved by the Alfred Hospital Ethics Committee, Melbourne, Australia (project 596/17) and South Eastern Sydney Local Health District (SSA reference: 18/G/166). This study was also approved by ACON Research Ethics Review Committee (RERC Reference Number: 2018/17) with support from SWOP (Sex Workers Outreach Project NSW). This project was also reviewed by RhED (Resourcing Health & Education), a service for sex workers in Victoria.

Results

Case-control study

There were 386 surveys included from MSHC, of which 23 (6.0%) were cases and 363 (94.0%) were controls. There were 278 surveys included from SSHC, of which 60 (21.6%) were cases and 218 (78.4%) were controls (Figure 1). Thus, the total number of cases was 83 (12.5%) and total number of controls was 581 (87.5%). Of the 664 surveys included in the analysis, there were 542 (81.6%) surveys that were returned with every section complete, 12 (1.8%) with every section except demographics and mouthwash complete, and 110 (16.6%) with every section except the sex practice with clients and non-commercial partners complete. Being born in China or other overseas countries aside from Thailand was associated with returning the survey with incomplete sections for sexual practices (supplemental table 1).

The median age of participants was 30 years [interquartile range (IQR): 25-36] and participants at SSHC were older than those from MSHC (median age 33 vs 28; $P<0.001$) (Table 1). Cases were older than controls (median age 32 vs 30 years; $P=0.01$).
There were 54 transgender and gender diverse participants (8.1%). Most participants were born in Australia or New Zealand (230; 34.6%), followed by Thailand (166; 25.0%), China (156; 23.5%),

and other countries (112; 16.9%). Overall, there were 260 participants who were newly arrived to Australia (39.2%). For those cases who were born outside of Australia, the median length of time in Australia was 2 years (IQR: 1-3), compared to 3 years (2-6) for controls (*P*=0.002). There was no difference in the proportion of transgender and gender diverse participants between the two sites (28 [7.3%] from MSHC vs 26 [9.4%] from SSHC; p=0.329). Most participants from SSHC were born in Thailand (147; 52.9%), China (120; 43.2%), or Taiwan (5; 1.8%), however there were 6 (2.1%) who were born in other countries. Most participants from MSHC were born in Australia or New Zealand (228; 59.1%), followed by China (36; 9.3%), Thailand (21; 5.4%), India (7; 1.8%) and Malaysia (7; 1.8%). The remaining 87 (22.5%) participants from MSHC were from 39 different countries. For those cases born outside of Australia, the median length of time in Australia was 2 years (IQR: 1-3), compared to 3 years (2-6) for controls (p=0.002).

Table 1: Risk factors for oropharyngeal gonorrhoea among 664 female sex workers recruited from two sexual health clinics in Australia

	Cases, n (%) N=83	Controls, n (%) N=581	OR (95% CI)	aOR (95% CI)	*P* value for aOR
Site					
MSHC	23 (27.7)	363 (62.5)	ref	ref	
SSHC	60 (72.3)	218 (37.5)	4.3 (2.6-7.2)*	3.1 (1.5-6.2)	0.001
Gender identity					
Female	79 (95.2)	531 (91.4)	ref		
Trans and gender diverse	4 (4.8)	50 (8.6)	0.5 (0.2-1.5)		
Age (years)					
<=24	8 (9.6)	121 (20.8)	ref	ref	
25-34	43 (51.8)	289 (49.7)	2.3 (1.0-4.9)*	1.2 (0.5-2.9)	0.701
>=35	32 (38.6)	171 (29.4)	2.8 (1.3-6.4)*	1.1 (0.4-2.8)	0.847
Newly arrived to Australia (within 3 years)					
No	34 (41.0)	370 (63.7)	ref	ref	
Yes	49 (59.0)	211 (36.3)	2.5 (1.6-4.0)*	1.2 (0.6-2.1)	0.628
Smoke daily					
No	60 (72.3)	427 (73.5)	ref		
Yes	20 (24.1)	141 (24.3)	1.0 (0.6-1.7)		
Declined to report	3 (3.4)	13 (2.2)	1.6 (0.5-5.9)		
Use mouthwash[A]					
Infrequently	10 (12.1)	122 (21.0)	ref	ref	
Frequently	69 (83.1)	452 (77.8)	1.9 (0.9-3.7)*	1.0 (0.5-2.2)	0.970
Did not disclose	4 (4.8)	7 (1.2)	7.0 (1.7-27.9)*	11.2 (2.2-57.2)	0.004
Type (venue) of sex work					
Brothel only	47 (56.3)	289 (49.7)	ref		
Massage Parlour only	12 (14.5)	139 (23.9)	0.5 (0.3-1.0)*	0.2 (0.1-0.5)	<0.001
Multiple/other	24 (28.9)	150 (25.8)	1.0 (0.6-	1.0 (0.6-	0.903

venues			1.7)	1.9)	
Declined to report	0	3 (0.5)	--		
Sexual practices with clients					
Tongue kiss male clients[B]					
No	9 (10.8)	146 (25.1)	ref	ref	
Yes	51 (61.5)	348 (59.9)	2.4 (1.1-5.0)*	1.5 (0.7-3.5)	0.295
Declined to report	23 (27.7)	87 (15.0)	4.3 (1.9-9.7)*	3.3 (1.2-9.4)	0.022
Perform condomless fellatio with male clients[B]					
No	17 (20.5)	346 (59.6)	ref	ref	
Yes	48 (57.8)	144 (24.8)	6.8 (3.8-12.2)*	3.6 (1.7-7.7)	0.001
Declined to report	18 (21.7)	91 (15.7)	4.0 (2.0-8.1)*	1.1 (0.8-6.0)	0.136
Client ejaculated in mouth[B]					
No	43 (51.8)	440 (75.7)	ref	ref	
Yes	25 (30.1)	56 (9.6)	4.6 (2.6-8.0)*	1.4 (0.7-2.9)	0.317
Declined to report	15 (18.1)	85 (14.6)	1.8 (1.0-3.4)*	0.6 (0.3-1.5)	0.299
Sexual practices with not-at-work sexual partner					
Tongue kiss non-commercial sexual partner[C]					
No[D]	48 (57.8)	341 (58.7)	ref	ref	
Yes	20 (24.1)	182 (31.3)	0.8 (0.4-1.4)	1.4 (0.7-2.7)	0.303
Declined to report	15 (18.1)	58 (10.0)	1.8 (1.0-3.5)*	1.6 (0.5-5.4)	0.469
Performed condomless fellatio with not-at-work sexual partner[C]					
No[D]	57 (68.7)	397 (68.3)	ref		
Yes	8 (9.6)	104 (17.9)	0.5 (0.2-1.2)		
Declined to	18 (21.7)	80 (13.8)	1.6 (0.9-		

report			2.8)		
Not-at-work sex partner ejaculated in mouth[C]					
No[D]	68 (81.9)	453 (78.0)	ref	Ref	
Yes	1 (1.2)	70 (12.1)	0.1 (0.0-0.7)*	0.1 (0.0-0.6)	0.015
Declined to report	14 (16.9)	58 (10.0)	1.6 (0.9-3.0)	0.9 (0.3-3.1)	0.876

* Variables with *P* values <0.1 in the univariable analyses were included in multivariable analysis
[A] Infrequent mouthwash included those who selected never, yearly, or monthly. Frequent mouthwash included those who selected daily or weekly.
[B] Participants were asked to report any sex practices with male clients in an average working week
[C] Participants were asked to report sex practices with not-at-work male partners in previous 7 days
[D] Includes 328 controls and 47 cases who did not have a non-commercial sex partner
Note: MSHC: Melbourne Sexual Health Centre; SSHC: Sydney Sexual Health Centre

Most participants worked in only one type or venue of sex work; most worked at brothels only (n=336; 50.8%), followed by massage parlour (n=151; 22.8%), private (n=72; 10.7%) and street-based (n=1; 0.15%). There were 100 participants who worked in more than one type or venue of sex work, of which the most common combination was brothel and private (n=56; 56.0%).

Of the 578 participants who answered the question on number of male clients in an average working week, the median was 10 clients (IQR: 6-20); there was no significant difference in the number of clients between cases and controls (*P*=0.18; table 2). There were no significant differences in the proportion who performed fellatio on clients, received cunnilingus from clients, had vaginal or anal sex with clients, or had sex involving sex toys between cases and controls (Table 2). However, a significantly higher proportion of cases tongue kissed their clients (85.0% [51/60] vs 70.4% [348/494]; *P*=0.018), performed condomless fellatio on clients (73.8% [48/65] vs 29.4% [144/490];*P*<0.001), had condomless vaginal sex with clients (28.3% [17/60] vs 16.6% [78/470]; *P*=0.026), and condomless anal sex (55.6% [10/18] vs 30.6% [56/183]; *P*=0.031) in an average working week.

There was no difference in the total number or proportion of clients with whom they engaged in each sexual activity between cases and controls (Table 2), except cases reported fewer clients with whom they performed fellatio (median=5 [IQR: 3-10]) than controls (mean=9 [IQR: 4-14]; *P*=0.006) (Table 2). However,cases had performed condomless fellatio on more clients than controls (median=3 [IQR: 0-6] for cases; median=0 [IQR: 0-1] for controls; *P*<0.001).

Table 2: Number of male clients seen in an average working week among female sex workers by cases with oropharyngeal gonorrhoea and controls.

	Case (n=83)	Control (n=581)	*P* Value*
Median number of male clients seen in average working week, (IQR)[A]	10 (5-15)	10 (6-20)	0.176
Tongue kissed male client in average working week			0.018
No, n(%)	9 (10.8)	146 (25.1)	
Yes, n(%)	51 (61.5)	348 (59.9)	
Declined to report, n(%)	23 (27.7)	87 (15.0)	
Median number of clients tongue kiss, (IQR)	2 (0-9)	2 (0-6)	0.174
Proportion of clients tongue kiss, %(IQR)[B]	40 (10-90)	50 (10-80)	0.427
Perform fellatio on male client in average working week			0.050
No, n(%)	2 (2.4)	54 (9.3)	
Yes, n(%)	63 (75.9)	447 (76.9)	
Declined to report, n(%)	18 (21.7)	80 (13.8)	
Median number of clients performed fellatio on, (IQR)	5 (2-9)	7 (2-14)	0.119
Proportion of clients performed fellatio on, (IQR)[B]	90 (50-100)	70 (30-99)	0.017
Perform condomless fellatio on male client in average working week			<0.001
No, n(%)	17 (20.5)	346 (59.6)	
Yes, n(%)	48 (57.8)	144 (24.8)	
Declined to report, n(%)	18 (21.7)	91 (15.7)	
Median number of clients performed condomless fellatio, (IQR)	1 (0-3)	0 (0-0)	<0.001
Proportion of clients performed condomless fellatio on,(IQR)[B]	50 (40-80)	50 (20-90)	0.291

Receive cunnilingus from male client in average working week			0.136
No, n(%)	5 (6.0)	75 (12.9)	
Yes, n(%)	57 (68.7)	422 (72.6)	
Declined to report, n(%)	21 (25.3)	84 (14.5)	
Median number of clients received cunnilingus from, (IQR)	3 (1-7)	4 (1-8)	0.622
Proportion of clients received cunnilingus from (%), median (IQR)[B]	40 (10-50)	50 (20-70)	0.076
Vaginal sex with clients in average working week			0.237
No, n(%)	9 (10.8)	54 (9.3)	
Yes, n(%)	45 (54.2)	428 (73.7)	
Declined to report, n(%)	29 (34.9)	99 (17.0)	
Median number of clients had vaginal sex with, (IQR)	5 (2-15)	8 (3-15)	0.108
Proportion of clients had vaginal sex with, (IQR)[B]	90 (60-100)	95 (80-100)	0.690
Condomless Vaginal sex with clients in average working week			0.026
No, n(%)	43 (51.8)	392 (67.5)	
Yes, n(%)	17 (20.5)	78 (13.4)	
Declined to report, n(%)	23 (27.7)	111 (19.1)	
Median number of clients had condomless vaginal sex with (n), median (IQR)	0 (0-0)	0 (0-0)	0.001
Proportion of clients had condomless vaginal sex, (IQR)[B]	20 (20-70)	50 (10-90)	0.374
Anal sex with clients in average working week			0.398

No, n(%)	45 (54.2)	395 (68.0)	
Yes, n(%)	6 (7.2)	77 (13.3)	
Declined to report, n(%)	32 (38.6)	109 (18.8)	
Median number of clients had anal sex with, (IQR)	0 (0-0)	0 (0-0)	0.921
Proportion of clients had anal sex with (%), median (IQR)[B]	35 (5-80)	10 (5-30)	0.207
Condomless anal sex with clients in average working week			0.031
No, n(%)	8 (9.6)	127 (21.9)	
Yes, n(%)	10 (12.1)	56 (9.6)	
Declined to report, n(%)	65 (78.3)	398 (68.5)	
Median number of clients had condomless anal sex with, (IQR)[B]	0 (0-0)	0 (0-0)	0.370
Proportion of clients had condomless anal sex with, (IQR)[B]	100 (100-100)	100 (99-100)	--
Use sex toys with clients in average working week			0.189
No, n(%)	41 (49.4)	321 (55.3)	
Yes, n(%)	12 (14.5)	147 (25.3)	
Declined to report, n(%)	30 (36.1)	113 (19.5)	
Median number of clients had sex involving toys, (IQR)	0 (0-0)	0 (0-0)	0.565
Proportion of clients had sex involving toys, (IQR)[B]	20 (10-50)	10 (5-20)	0.139

*P values were calculated excluding those who declined to report each practice using chi2 test for categorical variables and Mann-Whitney U test for continuous variables

[A]There were 15 cases and 71 controls who declined to report number of clients and thus were excluded from this analysis

[B]. Partner number for each activity was calculated by multiplying the proportion of clients with whom they performed each activity by the total number of clients seen in an average working week.

In the multivariable logistic regression, after adjusting for recruiting site, age, length of time in Australia, frequency of mouthwash use, tongue kissing male clients, performing condomless fellatio on male clients, whether clients ejaculate in their mouth, tongue kissing non-commercial sexual partners and whether non-commercial sexual partners ejaculate in their mouth, the only sex practice that was a risk factor for oropharyngeal gonorrhoea was performing condomless fellatio on male clients (adjusted odds ratio [aOR]: 3.6, 95%CI: 1.7-7.6; *P*=0.001) (Table 1).

There were 22.6% (120/530) of participants who believed mouthwash could prevent them acquiring STIs in the throat, 42.5% (225/530) who did not think mouthwash could prevent STIs in the throat and 34.9% (185/530) who said they didn't know. There was no significant difference among those who believed mouthwash could prevent STIs in the throat between cases and controls (*P*=0.255).

Qualitative Findings

In total, 63 SWs indicated interest in participating in the interviews and were contacted by a research nurse at MSHC. When contacted, 28 SW at MSHC agreed to participate and scheduled a time for the interview, however nine did not attend their scheduled interview and could not be reached to reschedule. In total, 19 participants completed interviews before data collection was discontinued. The age of the 19 participants ranged from 18 to 44 years, with a median of 28 years (IQR 24-31) (Table 3). The duration of interviews ranged from 24 to 61 minutes, with a median of 41 minutes. One participant in the qualitative interviews was a case in the case-control group, while the rest were from the control group.

Table 3: Participant demographics for qualitative interviews among 19 Female Sex Workers recruited from Melbourne Sexual Health Centre

	Number of participants
Gender Identity	
Female	18
Non-Binary	1
Oropharyngeal Gonorrhoea	
Case	1
Control	18
Age Range (years)	
18-24	7
25-30	6
31-35	6
Length of time in sex industry	
1 year or less	3
2 years	3
3+ years	13
Country of birth	
Australia/New Zealand	17
Overseas	2
Location of sex work	
Brothel	16
Massage parlour	1
Private	1
Brothel and Private	1

Mouthwash use at work	
Before and after clients	8
Before clients*	4
After clients*	3
Rarely/Never use	4

The qualitative data were organized into six descriptive themes relating to the kissing, oral sex practices and mouthwash among SWs (Table 4): 1) The ‘how’ and ‘why’ of kissing clients; 2) Always covered – fellatio with clients; 3) Not so risky - uncovered cunnilingus from clients; 4) Clients saliva as lubricant is a ‘no go’; 5) Pleasure with clients – a ‘perk’ or not part of the job; and 6) Mouthwash use with clients - a freshener and germ killer.

Table 4: An overview of FSWs practices—the WHAT, the WHY and the HOW from semi-structured interviews with 19 female sex workers recruited from Melbourne Sexual Health Centre

PRACTICE or EXPERIENCE	**The ‘WHAT’**	**The ‘WHY’ and ‘HOW’**
Kissing (Theme 1: The ‘how’ and ‘why’ of kissing clients)	Very common in some form	
	Sex worker initiated	Typically closed mouth/shallow
		To improve relationship with regular clients
		To facilitate a more intimate experience
		Pressured by client demand and availability
	Client initiated	Often negotiated prior to encounter
		Commanded higher premium
	Expectations for clients	Good oral hygiene
		Sobriety
Performing oral sex fellatio ***(Theme 2*** Always covered – fellatio with clients)	Very common	
	Condoms used always	Perceived as ‘high risk’
		Reduce STI risks
		Legal requirements
		Public health campaigns
	Client pressure	Financial incentive
		Waiting until encounter had begun
Receiving cunnilingus ***(Theme 3:*** <u>Not so risky – uncovered cunnilingus from clients)</u>	Very common	
	Dental damns never used	Perceived as ‘low’ or ‘no risk’
		Detracts from client experience
		Difficult to use
		Not common / industry standard
		No public health campaigns
Saliva as lubricant ***(Theme 4:*** Client’s saliva as lubricant-a ‘no go’)	Uncomfortable with client using saliva as lubricant	Perceived as ‘high risk’
		Disgusted by the idea
		Not as effective as actual lubricant
	May sometimes use their own saliva as lubricant	Not preferred over actual lubricant
		Will use out of convenience

Pleasure with clients ***(Theme 5:*** *Pleasure with clients—a 'perk' or not part of the job)*	Does not influence which sex practices engage in	
	Some feel it's not possible to feel pleasure with clients	Compartmentalising as 'work' and not for enjoyment
		Lack of emotional connection
	Pleasure infrequent but can impact kissing and cunnilingus	May kiss for longer or deeper
		May allow client to kiss or perform cunnilingus despite not paying for the service
	More enjoyment over time	More confident and relaxed with clients
Using mouthwash ***(Theme 6:*** *Mouthwash use with clients—a freshener and germ killer)*	Routinely used by some FSW	Freshen up prior to the booking
		Kill any germs may have picked up from client after the booking
		As a matter of routine to 'clean the slate' before the next client
	Occasionally used by some FSW	When feel their breath needs to be freshened up prior to a booking
		After a booking if left with unclean feeling
	Some never use mouthwash at work	Believe it's bad for oral health
	Most prefer clients use mouthwash prior to booking	Freshen breath
		Perception that it makes client less likely to transmit germs
		Brothel provides mouthwash
		Expectation that client uses mouthwash and showers before booking

1. <u>The how and why of kissing clients</u>

All participants in the qualitative interviews reported kissing at least some of their clients, however the style of kissing varied from closed mouth kissing ("pecks"), shallow tongue kissing, to deep tongue kissing. For most participants, whether or not they kissed clients depended on if the client requested the service before the booking as it is an additional cost, although there were a few participants who reported reserving kissing for regular clients, those they judged to have good oral hygiene (i.e. clean teeth), or those not visibly intoxicated.

The style and duration of kissing was most often dictated by the client's preference and initiation, with almost half of participants describing following the clients' lead. For example:

> *So, it's because they're paying for it, it's how they're wanting that to happen. I'll generally - if I'm doing the instigation of the kissing, it will usually be more*

pecking than full tongue. But there will still be saliva on the lips and that sort of thing. Then it's up to them how they want to take it further. I continue on the line that they're taking things. –Participant 5, age 30, less than a year in sex industry, brothel based

Other participants did not allow the client to dictate kissing style, instead they reported efforts to avoid deep kissing with clients such as kissing with closed teeth or telling the client to use less tongue. Some described general discomfort with deep kissing clients, including one who felt it was too intimate for work.

I just find the sharing of that much saliva is a bit… too…it's a bit too intimate for just my work…–Participant 1, age 24, 4 years in sex industry, massage parlour

While participants commonly stated pay was the only factor in deciding to kiss a client or not, there were several who felt pressured to agree to kiss clients to compete with other sex workers for clients. A couple of participants, however, felt kissing clients enhanced the booking in terms of making the service feel more genuine as well as allowing them to engage with the client in a more natural way.

2. Always covered - fellatio with clients

All participants described performing oral sex (fellatio) on some clients and all reported always using condoms for this practice. Almost all participants reported the main reason for using condoms during fellatio was for safety reasons as they did not want to get a STI in the throat, while almost half of participants reported using condoms due to the legal requirement.As one participant shared:

Because it's the law and I want to be really safe. That's not - if I - I've had many, many, many people try to get it without a condom, but I don't know these people. I don't know where they've been. I need that protection Participant 9, age 18, less than a month in sex industry, brothel based

Many of these participants described seeing posters in their workplaces that caution against performing fellatio on clients without a condom. Some participants reported getting pressure from clients to perform oral sex without a condom, most often after the booking had commenced and they were alone in the room. Several participants reported men offering to pay more for a "natural" (condomless) fellatio service, and while reportedly declining these requests, several also said they knew of other sex workers in their workplaces who accept these offers for more pay.

3. Not so risky – uncovered cunnilingus from clients

All participants except one reported having some clients perform oral sex (cunnilingus) on them and none reported using a dental dam for this practice. Reasons for not using a dental dam varied, but the common sentiment among participants was that cunnilingus did not seem to place them at as much risk of STIs compared to them performing condomless fellatio on clients.

I've heard it's [cunnilingus] more likely to affect them more than me. That's what I've been told anyway. So it's like their risk, not mine and I know I'm clean,

because I get tested all the time.--Participant 6, age 26, 6 years in sex industry, brothel based

Other reasons for not using a dental dam revolved around the dental dam detracting from the experience for the client. Many participants described dental dams as being difficult to use and anticipated that enforcing clients to use one would deter them from booking services with them and ultimately lead to less bookings. Several participants commented that it was not industry standard to use dental dams and there were no posters warning sex workers to use them for oral sex like there were for condoms.

4. Client's saliva as lubricant a 'no go'

With few exceptions, almost all participants were uncomfortable having a client use their own saliva as lubricant for sex, though several described previously having clients spit on their hands and touch the participant's genitals without asking first and before they could be stopped. Reasons for not being comfortable included a fear of getting STIs from the client's saliva, preferring actual lubricant over saliva in general as it's more effective, and being generally disgusted by the client's saliva. As one participant said:

Um, it's [client's saliva] kind of gross I guess it's kind of a bit sticky and not very, yeah, not very effective. –Participant 4, age 21, less than a year in sex industry, brothel based

In general, most participants described preferring actual lubricant during sex for its effectiveness over using their own saliva as lubricant with clients. There were, however, several participants who were comfortable using their own saliva on occasion. For these participants, saliva was only used as lubricant because of the convenience , with most still preferring lubricant if it was on hand.

Participants were not explicitly asked to reflect on why they might be comfortable with a client performing cunnilingus on them without a dental dam but not having a client use their saliva as a lubricant for vaginal sex. Several participants however, raised this of their own accord. For one participant, the reasoning for this was because the saliva used as a lubricant would go inside her body, whereas she imagined the client's saliva during cunnilingus is not necessarily "inserted" into her vagina.

5. Pleasure with clients – a 'perk' or not part of the job

Most participants felt that their pleasure in a booking would not influence their decision to engage in oral sex practices with clients but rather was seen as a fringe benefit.

No, not really. If I'm enjoying it, then I'm enjoying it, and that's just a lucky perk. I wouldn't stray from my boundaries just because they've kind of sprung something on me or whatnot. My service is my service and I stick to it.—Participant 12, age 26, 8 years in sex industry, brothel based

Of these participants who said pleasure was not a factor in their decision to engage in oral sex practices with clients, several felt that actually feeling pleasure from the sex work was not possible as they compartmentalized their work as work rather than for enjoyment. For others they felt pleasure during sex work was not possible due to the lack of emotional connection.

I find that I, um, even if I have like the best client in the world, I'm never gonna, like have a pleasurable experience at work, because you're always just like, on your guard a little bit, and you're, I'm at work, you know … like I'm like just totally zoned out (laughs) Like they don't think that, but I'm like thinking about what I'm going to eat for dinner, and, just like whatever, and so… I'll never be like "I-I really wanna do this thing, and like get pleasure out of this" that will never happen…But, I will definitely make choices to avoid, like, things that I know I definitely don't like.—Participant 2, age 26, 2 years in sex industry, brothel based

However, there were several participants for whom their pleasure, while infrequent with clients, could influence the duration or style of sex practices with clients, most notably kissing and cunnilingus (but not condom use). These participants described kissing for longer or deeper if they were enjoying the service with the client and for some allowing the client to kiss or perform cunnilingus on them if they had not paid for the service, or simply to perform cunnilingus on them for longer if it was enjoyable.

… like if it was someone where there was a lot of saliva and it wasn't really feeling very good, I probably would let them do that for a while and then I'd just sort of be like "oh, it's your turn now." But if I'm having a really good time and it's feeling really great, I'm not going to interrupt, and stop that person from what they're doing sooner, if it means that I might get to have a really great time or even reach climax. You just kind of go along with it a bit more when it's like, a really good time. But not to the point where I would, you know, not to the point where I would have unprotected oral sex on them, or oral, or vaginal sex with me.—Participant 14, age 32, 2 years in sex industry, brothel based

For the participants who felt their pleasure sometimes influenced their oral sexual practices with clients, all but one stated sex work became more enjoyable over time after they became more confident in their work.

[I enjoy it more now] Because I'm more relaxed with my clients, I'm more confident and experienced and I like to connect with them. Whereas before, I was like I don't want to get to know you, but now I pretty much make friends with all my clients, so it's more enjoyable.—Participant 7, age 24, 4 years in sex industry, brothel based

6. Mouthwash use with clients - a freshener and germ killer

Almost half of the participants reported using mouthwash before and after clients at work as a matter of routine. The main reason for using mouthwash before a client was to freshen up their breath before the booking. The main reason for using mouthwash after a client was to kill any germs they might have gotten from the client during the booking, particularly germs that cause bad breath and the common cold however gonorrhoea was also occasionally mentioned. The other reason was to "clean the slate" for the next client; using mouthwash helped them feel refreshed and ready to see the next client.

"…when I use mouthwash and redo my make-up, it's like okay, that client's finished, done with, go out and I'm ready to present again for the next client".—

Participant 9, age 18, less than a month in sex industry, brothel based

The remaining half of participants used mouthwash less routinely and tended to use it before a booking if they felt they needed to freshen their breath or after a client who was a smoker or had left a feeling of uncleanliness in their mouth. There were only a few participants who never used mouthwash at work and these participants did not believe mouthwash was good for their oral health.

Most participants preferred clients to use mouthwash before bookings so that they had fresher breath and were less likely to transmit germs. Generally, for these participants, the brothels provided mouthwash and disposable cups for clients to use and the mouthwash is poured and waiting for them when they enter the room for the booking. In this way the participant does not have to ask the client to use mouthwash directly, which several described they would feel too uncomfortable doing since it might be considered rude. Several others however, reported they did not hesitate to ask clients to use the mouthwash if they noticed it had not been used or if their breath smelt.

One participant, the only participant in our interviews who was a case upon recruitment (had oropharyngeal gonorrhoea), made clients use a "cocktail" of mouthwash she brought from home for a full minute which combined Betadine, an antibacterial sore throat gargle, with Cepacol, an antibacterial mouthwash, which she used before and after every client as well. This participant had been using this "cocktail" of mouthwash before every client for two months before she became infected with oropharyngeal gonorrhoea. This participant did not have outside of work sexual partners and did not perform fellatio without a condom with clients, nor did she report any other oral sex practices (i.e. rimming or spit play) aside from tongue kissing. She felt her "cocktail" of mouthwash was keeping her safe from germs that cause colds and gave her the security to engage in "passionate" tongue kissing that she felt gave her a competitive edge over other sex workers.

Like, if I don't kiss at all, even lips, they will feel like "oh, this girl, she's terrible, I'm not coming back" Like how can I have a passionate moment if I don't kiss, you know? I try to trick them, like, oh it's a passionate kissing without opening my mouth, you know what I mean? But like, if I do kiss with tongue, they love it. Like, they fall in love, they will always come back, and they will tell their friends, so their friends will come. Like most of my regular clients, I get them because of that, that treatment, you know? But obviously I won't do that to someone I don't feel comfortable. But it does help me to make a lot of money, you know. Have a lot of clients, and regular clients. And you know what because I do the mouthwashing, I ask them to do, I put hand sanitizer in their hands, I mean I ask them to use, they have a perception that I am a very clean person as well, and they always feel safe with me as well, you know?—Participant 17, age 33, 2 years in sex industry, brothel based

Discussion

This mixed methods study identifies risk factors for oropharyngeal gonorrhoea among SWs in Australia's two most populous cities, and it provides some explanations for the factors and forces that underpin oral sex and mouthwash practices. Our findings show that performing condomless

fellatio with clients is associated with oropharyngeal gonorrhoea. Furthermore, SWs frequently tongue kiss clients as previously reported [16, 41], yet this practice was not a significant risk factor for oropharyngeal gonorrhoea. From our interviews with SWs in Melbourne, almost all reported kissing clients due to demand for 'the girlfriend experience' and generally reported following the client's lead with kissing style and duration. However, they used condoms for fellatio often citing it is illegal not to in Victoria and they considered condomless fellatio a risky practice for contracting STIs, unlike cunnilingus without a dental dam. Client saliva use as a lubricant is likewise often viewed as risky and 'gross' even among those who engage in cunnilingus with clients without a dental dam.

Our study shows high proportions of condom use among SWs for fellatio with clients. Previous studies have reported 79% [16] of FSWs use condoms for all fellatio activities with clients in Melbourne in an average working week and 75% in Sydney [35] in the previous three months. It is possible that SWs who are not attending sexual health clinics routinely may practice condomless fellatio more often with clients. One study from Sydney in 2017 examining advertisements for private sex work found that half of the FSWs with online profiles were offering condomless fellatio (170 of 339; 50.2%)[42], however it is not clear how often these sex workers actually practice condomless fellatio in an average working week.

In our multivariable analysis, kissing was not a significant risk factor for oropharyngeal gonorrhoea, however it should be noted that the adjusted odds of having oropharyngeal gonorrhoea was 1.5 (95% CI: 0.7 to 3.5) among SWs who tongue kissed male clients compared to those who did not tongue kiss male clients. The odds ratio is greater than one even though it is not statistically significant, suggesting kissing could be a potential risk factor for oropharyngeal gonorrhoea and may have some clinical and public health implications. The non-statistically significant result may be due to the limited sample size to have sufficient power to detect the difference as the study was ceased earlier due to the COVID-19 pandemic. Given the overlapping nature of sex practices, particularly kissing, this is a common issue when determining risk factors for oropharyngeal gonorrhoea[9]. It is interesting to note that the one case who was interviewed for the qualitative study had only reported tongue kissing clients in the previous two weeks as a risk factor for oropharyngeal gonorrhoea as she did not have condomless fellatio with clients or engage in other practices with clients that involved saliva, and she had no non-commercial sexual partners. However, previous research has found kissing to be a risk factor for oropharyngeal gonorrhoea among MSM , and performing fellatio was not [8].This is likely due to differences in testing practices and risk perceptions among MSM compared to heterosexual men who are more likely to be clients of sex workers in our study.

There have been previous case reports and epidemiological studies suggesting tongue kissing can transmit oropharyngeal gonorrhoea[8, 43, 44]. It is also interesting that this participant was diligent about using and having her clients use a particular cocktail of mouthwash (Betadine and Cepacol) before each booking, and after the booking in her case, because she was afraid of catching a cold from a client and having to take time off work. While investigations are being made into the role of Listerine[22, 23], no studies to our knowledge have investigated the role of antibacterial mouthwashes such as Betadine and Cepacol in the transmission of gonorrhoea. It is possible the mouthwash cocktail she was performing with her clients altered her oral microbiome in an unfavorable way and increased her odds of getting gonorrhoea. A previous study examining the incidence of syphilis among 96 MSM in Indonesia (2019) found that using antibacterial mouthwash containing chlorhexidine increased the odds of syphilis acquisition, and it was likewise suggested this could be in part to changes in the oral microbiome[45]. An Australian clinical trial has shown that daily use of Listerine or Biotene for 12 weeks had no significant effect on the oral microbiome, [46] however no study to our knowledge has examined the effect of Betadine and Cepacol used in

combination on the oral microbiome. In any event, it is clear from our interviews that for some SWs, mouthwash use gives the feeling that it protects against bacteria and viruses and is thus used as a safety precaution (in addition to being widely used for hygiene purposes) therefore determining the role of mouthwash use with regards to gonorrhoea prevention is important in order to inform best practice.

Our findings from the case-control study that frequent mouthwash use was not associated with oropharyngeal gonorrhoea positivity is consistent with a previous study among MSM which found no association between using any mouthwash daily and oropharyngeal gonorrhoea positivity[47]. The duration and method of using mouthwash (i.e. rinsing or gargling) can vary between individuals and it remains to be seen whether duration and method could influence the ability of mouthwash to reduce the amount of gonorrhoea bacteria in the oropharynx. Among a study of at-risk populations for oropharyngeal gonorrhoea, FSWs used mouthwash for the shortest duration (median 14 seconds) however this was not a significant difference[48]. Future recommendations with regards to mouthwash use in this population, should it be found to be beneficial at reducing gonorrhoea transmission, should take into account duration and method of use.

Our results showed no significant difference between controls and cases in the number of clients with whom they performed fellatio. A previous case-control study among MSM in Melbourne (2018) that found number of casual partners in the past three months was an independent risk factor for oropharyngeal gonorrhoea[9]. When limiting the analysis to only those sex workers who reported performing fellatio on clients (excluding those who do not perform this activity in an average working week) during an average working week, cases had fewer clients with whom they engaged in fellatio (median 5 for cases, 7 for controls, p=0.012; data not shown in Results). It is possible that FSWs who perform condomless fellatio with clients see fewer clients in an average working week given they may make more money per client offering this service compared to only offering fellatio with a condom, as some participants in the qualitative interviews reported being offered more money by clients to perform “natural” or condomless fellatio (though none of our participants reported accepting these offers, in part due to concerns over STI transmission). It is also possible that having fewer clients is part of a risk-reduction strategy among FSWs who perform condomless fellatio. Further research is required to investigate why FSWs who offer condomless fellatio might perform fellatio on fewer clients than those who do not.

There was a higher proportion of cases who reported tongue kissing clients in an average working week compared to controls (85.0% of cases kissed clients in an average working week compared to 70.4% of controls). However, in contrast to performing fellatio on clients, among those who said yes to kissing clients there were no differences in the number of clients that cases tongue kissed in an average working week compared to controls. In our study there were 399 (60.0%) FSWs who answered yes to kissing clients in an average working week, which is lower than a cross-sectional survey of FSWs from MSHC in 2018 found (83.7%)[16]. This could be in part due to recruitment for this study being at two sites, and including a higher proportion of non-Australian FSWs, as the 2018 study showed Asian-language speaking FSWs were significantly less likely than English speaking FSWs to tongue kiss clients [16]. FSWs recruited from SSHC and those born in China, Thailand or other overseas countries were less likely than those recruited at MSHC and those from Australia/New Zealand to report tongue kissing (data not shown).

For some participants in our qualitative interviews, kissing, along with cunnilingus, were the only sexual practices that might be influenced by how much pleasure the SW was experiencing during the booking, though pleasure impacting these behaviors were generally reported as rare occurrences. For these participants, they described kissing for longer or deeper if they were enjoying the booking.

However, most of the participants in our study described experiencing pleasure at work as an infrequent or nonexistent occurrence. There has been limited research into pleasure for SWs during sex work. A previous qualitative study of nine FSWs in Victoria explored this concept and reported that for some women sexual pleasure was possible with a client only after developing intimacy through seeing them multiple times, however this study was exploratory and specifically recruited women who had positive experiences of sex work [49]. Further research could clarify the extent to which SWs experience sexual pleasure at work and whether this impacts sexual practice.

The main limitation to this study is that most of the cases were recruited from one clinic (SSHC) and epidemiology may vary due to environmental and spatial factors. There was also a noted delay in recruiting cases at MSHC compared to SSHC which could indicate a higher rate of declining to participate. One reason for this may be the varying laws regarding sex work in the State of Victoria versus New South Wales, whereby performing condomless oral sex was illegal in Victoria but not in New South Wales. This may have been a deterrent for participation in this study as participants may not have felt comfortable reporting any sex practices that were illegal. Previous research has shown that regulated and criminalized sex work often discourages FSWs to seek health care[50], so it could be that they are less likely to disclose their sex practices to clinicians, which would make it difficult to assess risk. Despite a slower recruitment of cases from MSHC, among those SWs who participated in the survey, participants from MSHC were no more likely to decline to report sexual practice questions compared to those from SSHC after adjusting for oropharyngeal gonorrhoea diagnosis, age, and country of birth. Only being born in China or other overseas countries aside from Thailand and New Zealand were associated with declining to report sex practices on the survey.
Another limitation of this study was that our convenience sampling may have created a bias toward those who attended sexual health clinics for HIV/STI screening (or presented with symptoms), and this may not be generalisable to the whole SW population, including those who did not attend a sexual health clinic. Most of our participants worked in brothels and massage parlours and only one participated in street-based sex work, thus the findings may not be generalizable to those engaging in street-based sex work.

A final limitation of this study is that interviews for the qualitative component were only offered in Victoria due to the financial and logistic difficulties of the interviews being conducted only in English and by researchers only based at the MSHC. However, like all qualitative data, the qualitative component was not meant to be generalizable to the wider population of sex workers. Rather, this component of our study added additional depth and understanding to the data collected in the quantitative component among Melbourne based FSWs. These interviews were also cut short due to COVID-19, however sufficient meaning was generated from the data to answer the questions of clinical interest.
The availability of phone interviews in combination with face-to-face interviews can be considered a strength of our study as it allowed participants to freely disclose personal and sensitive information. We found that our interviews over the phone provided rich data that was comparable, and in some cases deeper, than our face-to-face interviews. Allowing the option of phone interviews, particularly asking the participants to select phone or face-to-face interview upon recruitment, likely encouraged a wider array of participants as it is possible some participants who would have been uncomfortable with a face-to-face interview opted to share their experiences over the phone rather than decline to participate. Our findings here reflect other studies which have shown no difference in data quality from phone interviews versus face-to-face interviews [51{Sturges, 2016 #689, 52]

Conclusion
Our study shows that condomless fellatio is a risk factor for oropharyngeal gonorrhoea among SWs despite most SWs using condoms with their clients for fellatio. Novel interventions, particularly

targeting the oropharynx, will be required for oropharyngeal gonorrhoea prevention

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Data availability

The data sets generated during and/or analyzed during this study are not publicly available due to ethics requirements considering the confidential nature of patient data. Further information can be obtained by contacting the Alfred Hospital Ethics Committee, Melbourne, Australia (project 596/17).

Conflicts of Interest

EPFC and JJO are supported by an Australian National Health and Medical Research Council (NHMRC) Emerging Leadership Investigator Grant (GNT1172873, GNT 1193955, respectively). CKF is supported by an NHMRC Leadership Investigator Grant (GNT1172900). JEB is supported by ARC DECRA grant DE200100049 BD is supported by a NHMRC Practitioner Fellowship (GNT1154828)

The authors have no other conflicts of interests to declare.

Author contributions

TRP, CKF, AM, BD, RG, RV, DC, JEB and EPFC were involved in study conceptualisation and design. KM, RM, and RW were involved with study recruitment and management. TRP and KM conducted the interviews. TRP analysed the data and wrote the first draft of the manuscript. JEB and EPFC provided supervision. All authors were involved in manuscript revision.

References

1. Mohammed H, Blomquist P, Ogaz D, Duffell S, Furegato M, Checchi M, et al. 100 years of STIs in the UK: a review of national surveillance data. Sex Transm Infect. 2018 Dec;94(8):553-8. PMID: 29654061. doi: 10.1136/sextrans-2017-053273.
2. Chow EPF, Grulich AE, Fairley CK. Epidemiology and prevention of sexually transmitted infections in men who have sex with men at risk of HIV. The Lancet HIV. 2019;6(6):e396-e405. doi: 10.1016/s2352-3018(19)30043-8.
3. Jasek E, Chow EP, Ong JJ, Bradshaw CS, Chen MY, Hocking JS, et al. Sexually Transmitted Infections in Melbourne, Australia from 1918 to 2016: nearly a century of data. Commun Dis Intell Q Rep. 2017 Sep 1;41(3):E212-E22. PMID: 29720070.

4. Unemo M, Golparian D, Eyre DW. Antimicrobial Resistance in Neisseria gonorrhoeae and Treatment of Gonorrhea. Methods Mol Biol. 2019;1997:37-58. PMID: 31119616. doi: 10.1007/978-1-4939-9496-0_3.
5. Wi T, Lahra MM, Ndowa F, Bala M, Dillon JR, Ramon-Pardo P, et al. Antimicrobial resistance in Neisseria gonorrhoeae: Global surveillance and a call for international collaborative action. PLoS medicine. 2017 Jul;14(7):e1002344. PMID: 28686231. doi: 10.1371/journal.pmed.1002344.
6. Fairley CK, Cornelisse VJ, Hocking JS, Chow EPF. Models of gonorrhoea transmission from the mouth and saliva. The Lancet Infectious Diseases. 2019. doi: 10.1016/s1473-3099(19)30304-4.
7. Cornelisse VJ, Williamson D, Zhang L, Chen MY, Bradshaw C, Hocking JS, 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 Sep;95(6):437-42. PMID: 30996106. doi: 10.1136/sextrans-2018-053803.
8. Chow EPF, Cornelisse VJ, Williamson DA, Priest D, Hocking JS, Bradshaw CS, 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 May 9. PMID: 31073095. doi: 10.1136/sextrans-2018-053896.
9. Cornelisse VJ, Walker S, Phillips T, Hocking JS, Bradshaw CS, Lewis DA, et al. Risk factors for oropharyngeal gonorrhoea in men who have sex with men: an age-matched case-control study. Sex Transm Infect. 2018 Jan 22. PMID: 29358525. doi: 10.1136/sextrans-2017-053381.
10. Marangoni A, Marziali G, Salvo M, D'Antuono A, Gaspari V, Foschi C, et al. Mosaic structure of the penA gene in the oropharynx of men who have sex with men negative for gonorrhoea. Int J STD AIDS. 2020 Mar;31(3):230-5. PMID: 32000586. doi: 10.1177/0956462419889265.
11. Lewis DA. Will targeting oropharyngeal gonorrhoea delay the further emergence of drug-resistant Neisseria gonorrhoeae strains? Sex Transm Infect. 2015 Jun;91(4):234-7. PMID: 25911525. doi: 10.1136/sextrans-2014-051731.
12. Chan PA, Robinette A, Montgomery M, Almonte A, Cu-Uvin S, Lonks JR, et al. Extragenital Infections Caused by Chlamydia trachomatis and Neisseria gonorrhoeae: A Review of the Literature. Infect Dis Obstet Gynecol. 2016;2016:5758387. PMID: 27366021. doi: 10.1155/2016/5758387.
13. Kirkcaldy RD, Weston E, Segurado AC, Hughes G. Epidemiology of gonorrhoea: a global perspective. Sex Health. 2019 Sep;16(5):401-11. PMID: 31505159. doi: 10.1071/SH19061.
14. Chow EP, Williamson DA, Fortune R, Bradshaw CS, Chen MY, Fehler G, et al. Prevalence of genital and oropharyngeal chlamydia and gonorrhoea among female sex workers in Melbourne, Australia, 2015-2017: need for oropharyngeal testing. Sex Transm Infect. 2019 Sep;95(6):398-401. PMID: 31113904. doi: 10.1136/sextrans-2018-053957.
15. Callander D, McManus H, Guy R, Hellard M, O'Connor CC, Fairley CK, 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 Mar;45(3):199-206. PMID: 29420449. doi: 10.1097/OLQ.0000000000000714.
16. Zappulla A, Fairley CK, Donovan B, Guy R, Bradshaw CS, Chen MY, et al. Sexual practices of female sex workers in Melbourne, Australia: an anonymous cross-sectional questionnaire study in 2017-18. Sex Health. 2020 Feb;17(1):53-60. PMID: 31928612. doi: 10.1071/SH19037.
17. Nelson AJ, Hausbeck Korgan K, Izzo AM, Bessen SY. Client Desires and the Price of Seduction: Exploring the Relationship Between Independent Escorts' Marketing and Rates. J Sex Res. 2020 May-Jun;57(5):664-80. PMID: 31050563. doi: 10.1080/00224499.2019.1606885.
18. Carbonero MA, Gómez Garrido M. Being Like Your Girlfriend: Authenticity and the Shifting Borders of Intimacy in Sex Work. Sociology. 2017;52(2):384-99. doi: 10.1177/0038038516688609.
19. Kontula A. The Sex Worker and Her Pleasure. Current Sociology. 2008;56(4):605-20. doi: 10.1177/0011392108090944.

20. Chow EPF, Walker S, Hocking JS, Bradshaw CS, Chen MY, Tabrizi SN, 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 Jun 28;17(1):456. PMID: 28659133. doi: 10.1186/s12879-017-2541-3.
21. Chow EPF, Fairley CK. Is it the end of mouthwash as an intervention for gonorrhoea? The Lancet Infectious Diseases. 2021;21(6):763-4. doi: 10.1016/s1473-3099(21)00195-x.
22. Van Dijck C, Tsoumanis A, Rotsaert A, Vuylsteke B, Van den Bossche D, Paeleman E, et al. Antibacterial mouthwash to prevent sexually transmitted infections in men who have sex with men taking HIV pre-exposure prophylaxis (PReGo): a randomised, placebo-controlled, crossover trial. The Lancet Infectious Diseases. 2021;21(5):657-67. doi: 10.1016/s1473-3099(20)30778-7.
23. Chow EPF, Williamson DA, Hocking JS, Law MG, Maddaford K, Bradshaw CS, et al. Antiseptic mouthwash for gonorrhoea prevention (OMEGA): a randomised, double-blind, parallel-group, multicentre trial. The Lancet Infectious Diseases. 2021;21(5):647-56. doi: 10.1016/s1473-3099(20)30704-0.
24. Rekart ML. Sex-work harm reduction. The Lancet. 2005;366(9503):2123-34. doi: 10.1016/s0140-6736(05)67732-x.
25. Harcourt C, Egger S, Donovan B. Sex work and the law. Sex Health. 2005;2(3):121-8. PMID: 16335539. doi: 10.1071/sh04042.
26. Sex Work Act, (1994).
27. Harcourt C, van Beek I, Heslop J, McMahon M, Donovan B. The health and welfare needs of female and transgender street sex workers in New South Wales. Aust N Z J Public Health. 2001;25(1):84-9. PMID: 11297309. doi: 10.1111/j.1467-842x.2001.tb00556.x.
28. Donovan B, Harcourt C, Egger S, Fairley CK. Improving the health of sex workers in NSW: maintaining success. N S W Public Health Bull. 2010 Mar-Apr;21(3-4):74-7. PMID: 20513305. doi: 10.1071/NB10013.
29. Donovan B, Harcourt, C., Egger, S., Watchirs Smith, L., Schneider, K., Kaldor, J.M., Chen, M.Y., Fairley, C.K.,, Tabrizi SN. The Sex Industry in New South Wales: a Report to the NSW Ministry of Health. Sydney: Kirby Institute University of New South Wales,, 2012.
30. Chow EP, Fehler G, Chen MY, Bradshaw CS, Denham I, Law MG, 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(7):e103081. PMID: 25048817. doi: 10.1371/journal.pone.0103081.
31. Australian STI Management Guidelines. Australasian Sexual Health Alliance. Funded by The Australian Government Department of Health. 2018 [1 August 2019]; Available from: http://www.sti.guidelines.org.au.
32. Engel JL, Fairley CK, Greaves KE, Vodstrcil LA, Ong JJ, Bradshaw CS, et al. Patterns of Sexual Practices, Sexually Transmitted Infections and Other Genital Infections in Women Who Have Sex with Women Only (WSWO), Women Who Have Sex with Men Only (WSMO) and Women Who Have Sex with Men and Women (WSMW): Findings from a Sexual Health Clinic in Melbourne, Australia, 2011-2019. Arch Sex Behav. 2022 Jul;51(5):2651-65. PMID: 35776396. doi: 10.1007/s10508-022-02311-w.
33. Barrientos-Duran A, de Salazar A, Fuentes-Lopez A, Serrano-Conde E, Espadafor B, Chueca N, et al. Comparison between Aptima(R) assays (Hologic) and the CoBAS(R) 6800 system (Roche) for the diagnosis of sexually transmitted infections caused by Chlamydia trachomatis, Neisseria gonorrhoeae, and Mycoplasma genitalium. Eur J Clin Microbiol Infect Dis. 2021 Jun;40(6):1337-42. PMID: 33492527. doi: 10.1007/s10096-020-04143-9.
34. Dean A, Sullivan KM, Soe MM. OpenEpi: Open Source Epidemiologic Statistics for Public Health, Version. www.OpenEpi.com, updated 2013/04/06. [6 May 2021].
35. Read PJ, Wand H, Guy R, Donovan B, McNulty AM. Unprotected fellatio between female

sex workers and their clients in Sydney, Australia. Sex Transm Infect. 2012 Dec;88(8):581-4. PMID: 22875839. doi: 10.1136/sextrans-2011-050430.
36. Prime Minister of Australia. Update on Coronavirus Measures. 2020 [updated 24 March 202019 August 2021]; Available from: https://www.pm.gov.au/media/update-coronavirus-measures-24-March-2020.
37. Neergaard MA, Olesen F, Andersen RS, Sondergaard J. Qualitative description - the poor cousin of health research? BMC Med Res Methodol. 2009 Jul 16;9:52. PMID: 19607668. doi: 10.1186/1471-2288-9-52.
38. Braun V, Clarke V. To saturate or not to saturate? Questioning data saturation as a useful concept for thematic analysis and sample-size rationales. Qualitative Research in Sport, Exercise and Health. 2019;13(2):201-16. doi: 10.1080/2159676x.2019.1704846.
39. Braun V, Clarke V. Thematic analysis. 2012. p. 57-71.
40. Clark J. How to Peer Review a Qualitative Manuscript. Peer Review in Health Sciences. 2nd ed. London2003. p. 219-35.
41. Chow EPF, Lew C, Tran J, Phillips TR, Maddaford K, Fairley CK. Understanding the duration of tongue kissing among female sex workers for potential oropharyngeal-oropharyngeal gonorrhoea transmission. Sex Transm Infect. 2023 Feb;99(1):75-6. PMID: 35523574. doi: 10.1136/sextrans-2022-055444.
42. Blackledge E, Thng C, McIver R, McNulty A. Rates of advertised condomless sex in the online profiles of private sex workers: a cross-sectional study. Sex Health. 2018 Feb;15(1):86-8. PMID: 28641708. doi: 10.1071/SH17068.
43. Cornelisse VJ, Bradshaw CS, Chow EPF, Williamson DA, Fairley CK. Oropharyngeal Gonorrhea in Absence of Urogenital Gonorrhea in Sexual Network of Male and Female Participants, Australia, 2018. Emerg Infect Dis. 2019 Jul;25(7):1373-6. PMID: 31211673. doi: 10.3201/eid2507.181561.
44. Chow EPF, Vodstrcil LA, Williamson DA, Maddaford K, Hocking JS, Ashcroft M, et al. Incidence and duration of incident oropharyngeal gonorrhoea and chlamydia infections among men who have sex with men: prospective cohort study. Sexually Transmitted Infections. 2020. doi: 10.1136/sextrans-2020-054764.
45. Handayani R, Subita GP, Mandasari M, Rahmayanti F, Soegyanto AI. Oral sexual behavior and oral hygiene effects on the syphilis incidence in MSM population. Journal of International Dental and Medical Research. 2019 (4):1516-21.
46. Plummer EL, Maddaford K, Murray GL, Fairley CK, Pasricha S, Mu A, et al. The impact of mouthwash on the oropharyngeal microbiota of men who have sex with men: a sub-study of the OMEGA trial. Microbiology Spectrum. 2022.
47. Chow EPF, Walker S, Read TRH, Chen MY, Bradshaw CS, Fairley CK. Self-Reported Use of Mouthwash and Pharyngeal Gonorrhoea Detection by Nucleic Acid Amplification Test. Sex Transm Dis. 2017 Oct;44(10):593-5. PMID: 28876323. doi: 10.1097/OLQ.0000000000000654.
48. Phillips TR, Fairley C, Maddaford K, Trumpour S, Wigan R, Bradshaw C, et al. Duration of gargling and rinsing among frequent mouthwash users: a cross-sectional study. BMJ Open. 2020;10(9). doi: 10.1136/bmjopen-2020-040754.
49. Smith EM. ‘It gets very intimate for me’: Discursive boundaries of pleasure and performance in sex work. Sexualities. 2016;20(3):344-63. doi: 10.1177/1363460716665781.
50. Platt L, Grenfell P, Meiksin R, Elmes J, Sherman SG, Sanders T, et al. Associations between sex work laws and sex workers' health: A systematic review and meta-analysis of quantitative and qualitative studies. PLoS medicine. 2018 Dec;15(12):e1002680. PMID: 30532209. doi: 10.1371/journal.pmed.1002680.
51. Novick G. Is there a bias against telephone interviews in qualitative research? Res Nurs Health. 2008 Aug;31(4):391-8. PMID: 18203128. doi: 10.1002/nur.20259.
52. Sturges JE, Hanrahan KJ. Comparing Telephone and Face-to-Face Qualitative Interviewing: a

Research Note. Qualitative Research. 2016;4(1):107-18. doi: 10.1177/1468794104041110.

Supplementary Files

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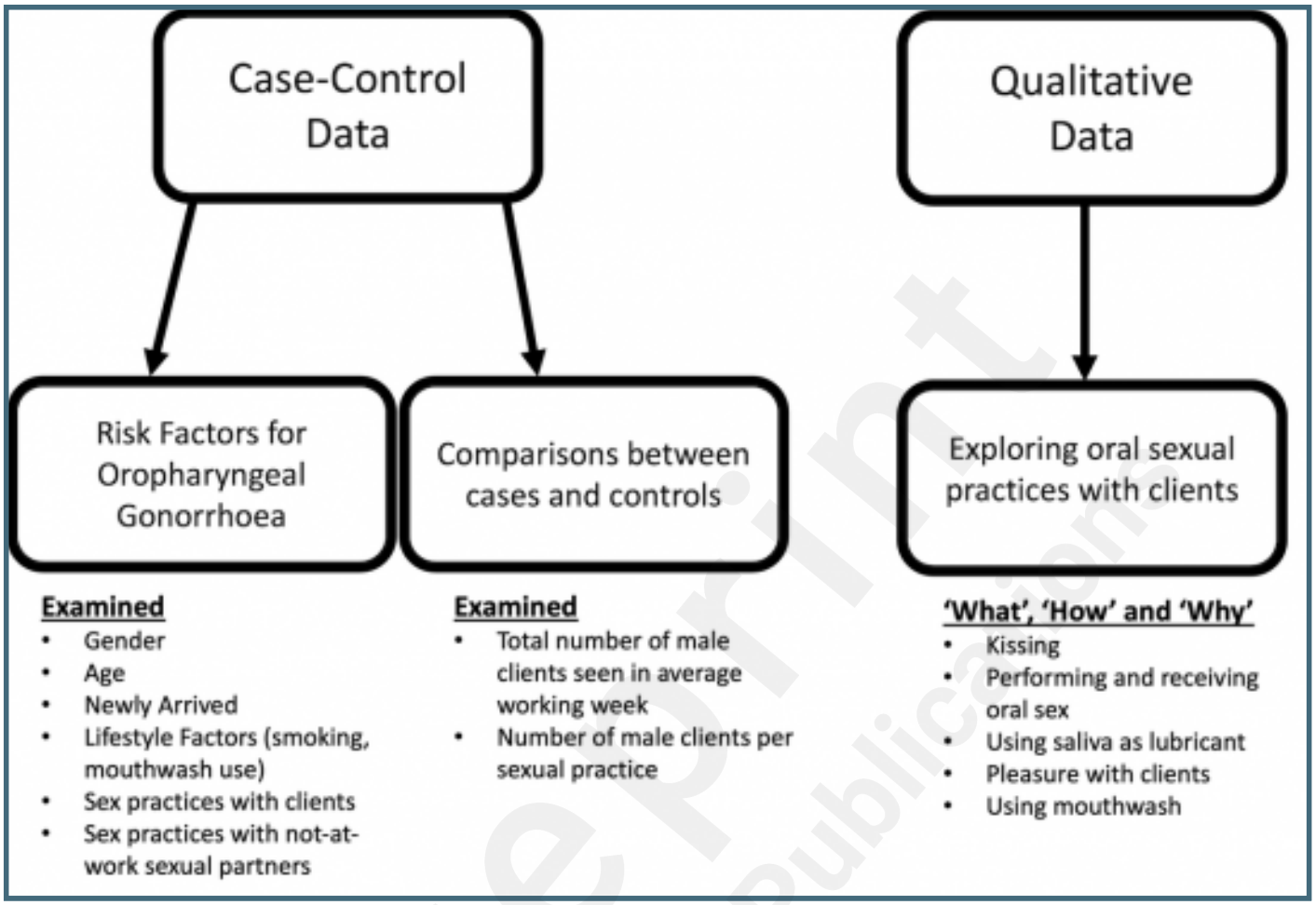
Figures

Supplementary Figure 2: Map of the data.



Recruitment flowchart.