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Seasonal variations in kissing and sexual activities among men who have sex with men in Melbourne, Australia: implications for seasonal sexually transmissible infection preventions and interventions

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Abstract. *Background:* Previous studies have shown that there is a peak in sexually transmissible infection (STI) cases and sexual activities around summer, but there has been no study examining whether kissing also follows a similar seasonal pattern. The aim of this study was to examine the seasonal patterns of kissing and sex partners among gay, bisexual and other men who have sex with men (MSM). *Methods:* A short cross-sectional study was conducted among MSM attending the Melbourne Sexual Health Centre between March 2016 and February 2017. Participants were asked to report the number of kissing-only, sex-only and kissing-with-sex male partners in the last 3 months. The mean number of male partners was calculated and stratified by Australia's seasons. The seasonal trend in the number of partners was assessed by negative binomial regression models. *Results:* In total, 4391 MSM were included in the analysis. The number of kissing-only and sex-only partners increased significantly from autumn to summer among MSM in Melbourne ($P_{\text{trend}} < 0.001$). MSM reported the highest number of male partners for kissing-only (mean: 4.91; 95% confidence intervals (CI): 4.78–5.04) and sex-only (mean: 1.91; 95% CI: 1.83–1.99) around summer compared with other seasons. However, the number of kissing-with-sex partners remained stable across seasons. *Conclusions:* The study data suggest that there is a peak in kissing-only and sex-only partners among MSM around summer and holiday seasons.

Additional keywords: bisexual, gay, gonorrhoea, holidays, homosexual, kiss, season, sexual behaviours, sexual practice, summer.

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Introduction

Rises in gonorrhoea cases have been reported not only in gay, bisexual and other men who have sex with men (MSM), but also in other populations such as female sex workers and heterosexuals worldwide.^{1–5} The rise of the epidemic is complex and is not well understood. Seasonal variations in human infectious diseases, including some sexually transmissible infections (STIs) such as genital herpes, chlamydia and gonorrhoea, have been observed.^{6–8} In the northern hemisphere, there is a peak in gonorrhoea cases during summer and autumn^{8–10} while in the southern hemisphere, similar changes were also observed during summer in Australia.^{11,12} The peak in STIs has been associated with a greater number of sexual partners during summer.¹¹ Understanding the seasonal patterns of STI and sexual activities is important to implement STI prevention campaigns at the right time, particularly during the peak of STI cases.

Oropharyngeal gonorrhoea has been proposed to contribute significantly to gonorrhoea transmission.^{13–15} Individuals with oropharyngeal gonorrhoea infection rarely develop symptoms, so individuals are not aware of their infections.¹⁶ Hence, undiagnosed and untreated oropharyngeal gonorrhoea infections would lead to ongoing gonorrhoea transmission within the sexual networks. Furthermore, the rise in antimicrobial-resistant *Neisseria gonorrhoeae* has become an emerging public health concern globally.^{17–20} Several treatment failure cases, particularly oropharyngeal gonorrhoea infections, have been reported worldwide,^{21–23} and this is likely due to the oropharynx being considered as an important reservoir of antimicrobial-resistant gonorrhoea infection.^{16,24} In this context, understanding the transmission of oropharyngeal gonorrhoea, in particular the role of kissing, is critical to its effective control.

Past studies have reported a seasonal variation in gonorrhoea cases, azithromycin resistance in *Neisseria gonorrhoeae* and number of sexual partners.^{11,25} Tongue-kissing is considered to be an important risk factor for gonorrhoea transmission, particularly among MSM,²⁶ but there has been no study examining the seasonal patterns in kissing. The aim of this study was to examine whether there are any seasonal variations in kissing and sexual activities among MSM in Melbourne, Australia.

Methods

Study population and setting

We conducted a cross-sectional, computer-based survey, named the 'Kissing' study at the Melbourne Sexual Health Centre (MSHC) between March 2016 and February 2017. The primary aim of the 'Kissing' study was to examine whether kissing is a risk factor for oropharyngeal gonorrhoea in MSM. The main findings and the methodology have been published elsewhere.²⁶ Results from this study have shown that MSM who had four or more kissing-only partners were 1.5-fold more likely to have oropharyngeal gonorrhoea after adjusting other confounding factors; however, there was no association between the number of sex-only partners and oropharyngeal gonorrhoea positivity. Furthermore, the study also found that younger MSM had more kissing-only partners but fewer sex-only partners than older MSM. However, the seasonal variations in kissing and sexual activities among MSM was not examined in the original study.

In brief, all men who reported having sex with another man in the last 12 months and aged ≥ 16 years attending MSHC during the study period were invited to participate in a short survey on kissing and sexual activities they had had in the last 3 months. The 'Kissing' study asked participants to report the number of male partners in the last 3 months in three different discrete categories: (1) kissing-only partners (the participant who only tongue kissed with their partners but did not have any sexual contacts); (2) sex-only partners (the participant who only had sexual contacts with their partners without kissing); and (3) kissing-with-sex partners (the participant who tongue kissed and had sexual contacts with their partners). A participant information sheet was provided to participants to read before they started the survey and consent was obtained from participants on the first page of the survey by them clicking 'yes' to the consent statement. Ethical approval for this study was obtained by the Alfred Hospital Ethics Committee, Melbourne, Australia (project number 69/16).

Statistical analysis

For the purpose of this analysis, we excluded participants who: (1) were aged < 16 years; (2) did not have any kissing or sexual partners in the last 3 months; or (3) completed the survey more than once within a 3-month period.

The dates of participation were categorised into four Australia's seasons: Autumn (March to May), Winter (June to August), Spring (September to November) and Summer (December to February). The mean number of partners by season was calculated and the 95% confidence intervals

(CIs) of the mean were calculated. Negative binomial regression models were used to examine whether there was a seasonal trend in the number of partners, and the incidence rate ratio (IRR) and its 95% CIs were calculated from the model. Given the number of partners reported in the last 3 months spans over two seasons and it may lead to bias, we performed a sensitivity analysis among MSM who reported their partners within one season (i.e. men completed the study at the end of each season: May, August, November and February). All statistical analyses were conducted using Stata (version 14; StataCorp, College Station, TX, USA).

Results

A total of 11 442 MSM were invited to participate in the 'Kissing' study and 4643 MSM (40.6%) completed the survey. Of those, 252 (5.4%) MSM did not meet the inclusion criteria and were excluded (Fig. 1). The remaining 4391 MSM were included in the final analysis. Age was not significantly different between participants and non-participants; however, a higher proportion of Australian-born MSM participated in the survey than overseas-born MSM (42.0% (2342/5581) vs 39.3% (2301/5861); $P = 0.003$). The median age of 4391 MSM was 30 years (IQR: 25–37) and 50.7% ($n = 2226$) were born in Australia.

Table 1 shows that the mean number of kissing-only partners was 4.29 (95% CI: 4.23–4.35), sex-only partners was 1.56 (95% CI: 1.52–1.60) and kissing-with-sex partners was 4.99 (95% CI: 4.92–5.05) in the last 3 months.

The mean number of kissing-only, sex-only and kissing-with-sex partners fluctuated monthly (Table S1, available as Supplementary Material to this paper). However, the seasonal analysis showed that the number of kissing-only partners (4.91; 95% CI: 4.78–5.04) and sex-only partners (1.91; 95% CI: 1.83–1.99) reported by MSM was the highest around summer compared with other seasons (Table 1). MSM were more likely to report a higher number of kissing-only partners (IRR: 1.24; 95% CI: 1.10–1.39) and sex-only partners (IRR: 1.30; 95% CI: 1.08–1.56) around summer compared with autumn (Table 2). In the sensitivity analyses, by including only those MSM who reported the number of partners within one season, we also found that the number of kissing-only partners peaked around summer (Tables S2 and S3); however, there were no significant seasonal patterns in the number of sex-only partners and kissing-with-sex partners.

Discussion

This study shows that the number of kissing-only and sex-only partners among MSM peaks around the summer period in Australia (between December and February), and this echoes the peak in STI during summer in past studies.^{11,12} While a few studies have looked at the seasonal variations in the number of partners,¹¹ we were unable to identify other published papers that had investigated the seasonal variations in kissing. In Australia, the summer period starts from December to February, which includes major holidays (e.g. Christmas, New Year and Australia Day) and large gay-related events (e.g. Midsumma Festival (Melbourne) and Mardi Gras

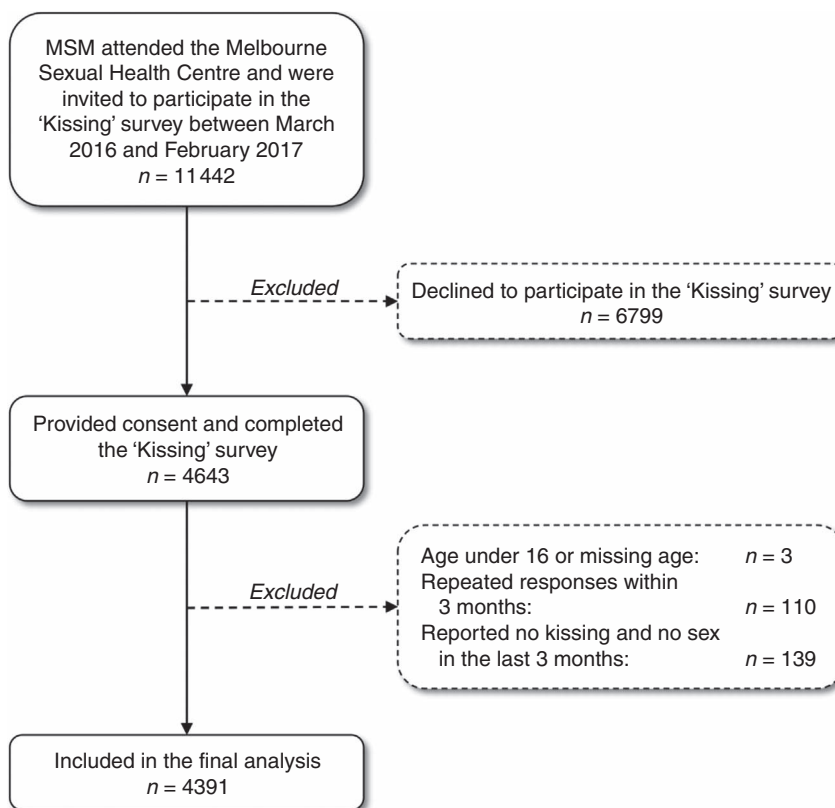


Fig. 1. A flow chart illustrating the selection process for the final analysis.

Table 1. Mean number of male partners among 4391 men who have sex with men, stratified by Australia’s seasons
MSM, men who have sex with men; CI, confidence interval

Australia’s seasons (months)	Number of MSM, <i>n</i>	Kissing-only partners Mean (95% CI)	Sex-only partners Mean (95% CI)	Kissing-with-sex partners Mean (95% CI)
Autumn (March–May)	1194	3.97 (3.86–4.08)	1.47 (1.40–1.54)	4.77 (4.65–4.90)
Winter (June–August)	1090	3.98 (3.87–4.10)	1.54 (1.47–1.62)	4.95 (4.82–5.08)
Spring (September–November)	1004	4.33 (4.21–4.46)	1.30 (1.24–1.38)	5.14 (5.01–5.29)
Summer (December–February)	1103	4.91 (4.78–5.04)	1.91 (1.83–1.99)	5.12 (4.99–5.25)
All year (March–February)	4391	4.29 (4.23–4.35)	1.56 (1.52–1.60)	4.99 (4.92–5.05)

Table 2. Incidence rate ratio of the number of male partners among men who have sex with men, stratified by Australia’s seasons
MSM, men who have sex with men; IRR, incidence rate ratio; CI, confidence interval; ref, reference

Australia’s seasons (months)	Kissing-only partners IRR (95% CI)	Sex-only partners IRR (95% CI)	Kissing-with-sex partners IRR (95% CI)
Autumn (March–May)	1 (ref)	1 (ref)	1
Winter (June–August)	1.00 (0.89–1.13)	1.05 (0.87–1.26)	1.04 (0.96–1.13)
Spring (September–November)	1.09 (0.97–1.23)	0.89 (0.74–1.07)	1.08 (0.99–1.17)
Summer (December–February)	1.24 (1.10–1.39)	1.30 (1.08–1.56)	1.07 (0.99–1.16)
<i>P</i> _{trend}	<0.001	0.037	0.061

(Sydney)). Previous studies have reported that a high number of partners are more likely to occur during the holiday seasons^{27,28} and gay-related events.²⁹ Large dance parties usually follow on after these events³⁰ and kissing has been associated with men

attending these dance parties at clubs or bars.^{31,32} A case study has identified that a sexual network of kissing and sexual activities occurred in a large annual music festival in Melbourne during summer in 2018.³³

Our findings suggest that the number of sex-only partners increases during the summer period compared with other seasons, and this echoes the observation where urethral gonorrhoea peaks in the summer period in Australia.¹¹ We also found that the number of kissing-only partners increases during the summer period but, to our best knowledge, there has been no studies examining the seasonal patterns of oropharyngeal gonorrhoea. Given oropharyngeal gonorrhoea infections are usually asymptomatic, any seasonal patterns of asymptomatic infections may be due to the patterns of screening. Past studies have shown that men are more likely to have kissing-only partners at particular venues such as gay bars or dance parties;^{31,32} however, sex-only partners may be more likely to be at sex-on-premise venues where men may prefer sex without the intimacy of kissing.³⁴ While, our findings suggest that there is no seasonal pattern in kissing-with-sex partners, further qualitative research is required to understand the motivation of men having kissing-only, sex-only and kissing-with-sex partners.

Understanding the seasonal variations in kissing and sexual activities may help in the design of STI prevention and intervention programs targeting at-risk populations during particular seasons. For example, a Swedish study found that September and October had the highest number of chlamydia cases, leading to the launch of an annual public health campaign named 'Chlamydia Monday', which aimed to increase the knowledge and awareness of chlamydia transmission by providing free testing and condoms on a particular Monday in September.⁶ Results from the 'Chlamydia Monday' campaign successfully showed a subsequent increase in chlamydia testing. Our findings suggest that kissing and sexual activities peak around the summer period, thus STI prevention campaigns on STI testing, knowledge and awareness should be scaled up around the summer period in Australia. More recently, several authors have raised the possibility that gonorrhoea could be transmitted through kissing.^{13,14,26,35} To date, there has been no intervention to prevent acquiring oropharyngeal gonorrhoea through kissing, although clinical trials and *in vitro* studies are currently underway in several countries to investigate whether antiseptic mouthwash could be used to prevent gonorrhoea.^{36,37} If mouthwash is found to be effective in preventing gonorrhoea, it can be translated into a public health campaign advocating mouthwash use, given the concept of using mouthwash to prevent gonorrhoea is highly accepted in MSM.^{38–41} In addition, such campaigns should be scaled up during the summer period when most men kiss, as shown in this study.

There are some limitations in this study regarding data interpretation. First, this study was conducted at a single urban sexual health centre in Melbourne, which may not be generalisable to other settings or the larger MSM population. A substantial proportion of men declined to participate in the survey, and it is possible that this may have biased our results.⁴² Second, the number of partners was measured in the last 3 months preceding the survey. Misclassification of the season may have occurred if men answered the survey starting their count at the beginning of the season because the number of partners reported by MSM were in the previous 3 months and therefore correspond to the previous

season. This may have affected our estimates and result in an over- or under-estimate of seasonal variations. However, we have performed a sensitivity analysis, which only included MSM who reported the number of partners within one season, and we have similar results and conclusions. Future studies examining weekly or monthly partner numbers may be useful to minimise the bias for seasonal analysis. Third, our cross-sectional design is not ideal to measure changes because it requires a 3-month recall period that may introduce recall bias. Ideally, a cohort design with frequent questionnaires would overcome this limitation, but would be logistically challenging to perform. Finally, this study only included data from a 1-year period, and it is possible that there were some unmeasured factors (e.g. gay-related events) that contributed to the changes in kissing and sexual activities during the study period. Future studies should include data covering more than 1 year to confirm this seasonal variation in kissing and sexual activities.

Our findings conclude that MSM have the highest mean number of kissing-only and sex-only partners around summer in Australia, suggesting that either there are social interactions during these periods or even that some of the increase is driven by biological changes in libido. If STI cases, kissing and sexual activities peak around summer, it is important to scale-up sexual health recourses and public health interventions and promotions during summer and holiday seasons to mitigate the rise in STI. Further research will be required to explore whether these seasonal variations in kissing and sexual activities are also observed among heterosexuals.

Conflicts of interest

The authors declare no conflicts of interest.

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