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Age, ethnic and travel-related disparities in kissing and sexual practices among heterosexual men in Melbourne, Australia

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Abstract. ***Background*:** The kissing practices of heterosexual men are not well understood, despite the potential of kissing to be a significant risk factor for gonorrhoea transmission. This study aimed to explore kissing and sex practices among heterosexual men. ***Methods*:** A cross-sectional survey among heterosexual men attending the Melbourne Sexual Health Centre in 2016–2017 was conducted. Men were asked to report their number of kissing-only (in the absence of sex), sex-only (in the absence of kissing) and kissing-with-sex partners in the last 3 months. The mean number of each partner type was calculated, and multivariable negative binomial regression was used to investigate associations between the number of different types of partners and demographic characteristics. ***Results*:** Of the 2351 heterosexual men, men reported a mean of 2.98 kissing-only, 0.54 sex-only and 2.64 kissing-with-sex partners in the last 3 months. Younger men had a mean higher number of kissing-only partners than older men (4.52 partners among men aged ≤24 years compared with 1.75 partners among men ≥35 years, $P < 0.001$). Men born in Europe had the most kissing-only partners (mean: 5.16 partners) and men born in Asia had the fewest kissing-only partners (mean: 1.61 partners). Men recently arrived in Australia, including travellers from overseas, had significantly more kissing-only partners (adjusted incidence rate ratio (aIRR): 1.53; 95% CI: 1.31–1.80) than local men. ***Conclusions*:** This study provides novel data about kissing practices of heterosexual men. Studies assessing oropharyngeal gonorrhoea should include measurements of kissing until studies can clarify its contribution to transmission risk.

Additional keywords: behaviour, gonorrhoea, kiss, sex, sexually transmissible infections, tongue kiss.

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Introduction

Kissing has been identified as a previously unrecognised risk factor for gonorrhoea among gay, bisexual and other men who have sex with men (MSM).[1,2] However, the practice of kissing has been poorly studied in the field of sexual health. Although previous studies have explored kissing practices among heterosexuals,[3] these studies did not distinguish the partners they only kissed compared with those they had both kissed and had sex with. The 2014 National Survey of Sexual Health and Behaviour conducted in the US demonstrated that kissing only, not accompanied by other sexual practices, represented 19.4% of the most recent sexual experience among 1493 adults, but this finding was not specific to heterosexual men and did not extend beyond the most recent sexual encounter.[3] Therefore, further research into the kissing practices of heterosexual men, particularly in the absence of other sexual practices, will help to illustrate its importance in the sexual repertoire.

Substantial rises in gonorrhoea have been reported in many developed countries, including Australia.[4–7] These rises are not only limited to MSM, but are also evident in other populations such as sex workers and heterosexuals.[7–13] Kissing in the absence of sex has been suggested as a possible route of gonorrhoea transmission in both MSM and heterosexuals.[14–16] We conducted this study to better understand the pattern of kissing in the absence of sex

among heterosexual men, as this is currently a knowledge gap in the literature; and kissing may be a significant and unmeasured risk of oropharyngeal gonorrhoea.

The aim of this study was to quantify the number of kissing-only, sex-only and kissing-with-sex partners among heterosexual men attending a public sexual health centre in Melbourne, Australia. We also explored the kissing patterns by demographic characteristics.

Methods

Study setting and population

A cross-sectional survey was conducted at the Melbourne Sexual Health Centre (MSHC) in Australia between July 2016 and February 2017. The MSHC is a major public sexual health clinic and located in the city of Melbourne, Victoria, Australia. The clinic provides ~50 000 consultations annually.[17] The MSHC provides a walk-in service and all clients are triaged-in by a registered nurse. Clients who are at higher risk of human immunodeficiency virus (HIV) or sexually transmissible infection (STI) or who have noticeable symptoms are prioritised at the MSHC. No referrals are required and all services are free-of-charge. On arrival, clients who attend the MSHC are directed to register their visit to the clinic and answer several questions, as part of routine care, using computer-assisted self-interviewing (CASI).[18] After completion of the routine CASI questions, all men were invited to participate in a short survey named the 'Kissing' survey, which included three additional questions on their kissing and sexual practices. Men who agreed to participate in this survey provided implied consent by clicking 'yes' via CASI. A 'decline' option was also provided for men who did not want to participate. We defined heterosexual men as men who reported only having sex with women in the last 12 months in this study. All heterosexual men who were aged ≥16 years were eligible to participate in this survey. If participants completed the survey more than once during the study period, only the first response of each participant was included in the final analysis. This study was approved by the Alfred Hospital Ethics Committee, Melbourne, Australia (number 69/16).

Exclusion criteria

The following participants were excluded from the final analysis: (1) men who reported sexual contact with a man in the last 12 months; (2) individuals who did not identify as male; (3) current sex workers; (4) participants who clicked 'yes' on the consent page but declined to answer all three questions in the survey.

Measurement

The definition of kissing used in our survey was tongue-kissing with a woman. Participants were asked to report the number of female partners they had had in the last 3 months in the following three categories: (1) the number of kissing-only (in the absence of sex) partners; (2) the number of sex-only (in the absence of kissing) partners; (3) and the number of kissing-with-sex partners (both sex and kissing with a specific partner during sexual contact). Sex was defined as any types of sexual contact (e.g. oral sex, vaginal sex or anal sex with women) other than tongue-kissing. Participants could have multiple types of partners concurrently.

Routinely collected demographic characteristics (i.e. age, marital status, place of birth and year of arrival in Australia (only for overseas-born participants)) were extracted from the MSHC's electronic database for analysis. Participants were categorised into three different age groups (≤24, 25–34 and ≥35 years), as per previous studies.[4] The place of birth was categorised into six major continents: (1) Australia or Oceania; (2) Europe; (3) Asia; (4) North America; (5) Latin America or Caribbean; and (6) Middle East or Africa.

Men who were born overseas and arrived in Australia within a 2-year period before the completion of the survey were defined as 'travellers from overseas or recently arrived in Australia'.[19] Marital status was categorised into either 'never married', 'married or de facto' or 'divorced, widowed, or separated'.

Statistical analyses

Descriptive statistics (e.g. mean and median) were calculated for the three different types of partners and were stratified by demographic characteristics (i.e. age, place of birth, marital status and traveller from overseas or recently arrived in Australia status). The non-parametric Kruskal–Wallis test was used to examine the differences in median of the number of partners across groups with different demographic characteristics. Urethral chlamydia positivity among participants was calculated as a marker for sexual risk and compared with all heterosexual men attending the MSHC during the study period. Chlamydia was diagnosed by using a nucleic acid amplification test (NAAT) using the Aptima Combo 2® Assay (Hologic Panther system; Hologic, San Diego, CA, USA). Gonorrhoea was not used as a marker of sexual risk because routine urethral gonorrhoea testing was not conducted on all heterosexual men at the time of the study, in line with the Australian guidelines at the time. However, urethral chlamydia testing was conducted on all heterosexual men.

Univariable and multivariable negative binomial regression models were used to examine the association between the number of partners and different demographic characteristics. Study variables with a P value <0.05 in the univariable analysis were considered as potential confounding factors and were included in the multivariable analysis. The adjusted marginal means and adjusted incidence rate ratios (aIRR) for each independent variable were calculated. Vuong's test was used to exclude the need for a zero-inflated model. All data analyses were performed using either Stata (version 14; Stata Corp., College Station, TX, USA) or IBM SPSS Statistics for Windows (Version 23.0; IBM Corp., Armonk, NY, USA). The scaled 3-Venn diagram with ellipses was constructed using eulerAPE (version 3; University of Kent, Canterbury, UK).[20]

Results

Study population

A total of 5095 heterosexual men attending the MSHC completed CASI during the survey period, of which 2971

(58.3%) agreed to participate in the 'Kissing' survey; 2351 (46.1%) participants were included in the final analysis (Fig. 1). There was no difference in the mean age of men who agreed or declined to participate in the survey (31.3 vs 31.0, $P = 0.99$). However, men who participated in the survey were more likely to be born in Australia or Oceania than those who declined to participate (48.8% vs 42.5%, $P < 0.001$). The positivity of urethral chlamydia did not differ between men who participated in this survey and all heterosexual men attending the clinic during the study period (7.1% vs 7.9%; $P = 0.27$).

The age of the participants ranged from 16 to 72 years, with a mean age of 31.3 years [standard error (SE), 0.20]. The most common place of birth for participants was Australia ($n = 1067$; 45.4%). More than half of the participants were never married ($n = 1616$; 68.7%). Most men had at least one regular ($n = 2333$; 99.2%) or casual female partner ($n = 2170$; 92.3%) in the last 3 months.

Figure 2 shows that 1788 of the participants (76.1%; 95% CI: 74.3–77.7%) had kissing-only partners, 597 (25.4%; 95% CI: 23.7–27.2%) had sex-only partners and 2254 (95.9%; 95% CI: 95.0–96.6%) had kissing-with-sex partners. A small proportion ($n = 34$, 1.4%; 95% CI: 1.0–2.0%) of the participants exclusively had sex-only partners in the last 3 months. Overall, men reported a mean of 2.98 (SE = 0.08) kissing-only, 0.54 (SE = 0.02) sex-only and 2.64 (SE = 0.07) kissing-with-sex male partners in the last 3 months (Table 1).

Age

Age was strongly associated with the number of kissing-only, sex-only and kissing-with-sex partners. Men aged 25–34 years had the highest mean number of kissing-with-sex partners (Table 1). Comparing with men aged ≥35 years, men aged ≤24 years (aIRR = 1.93; 95% CI: 1.66–2.25), and men aged 25–34 years (aIRR = 1.66; 95% CI: 1.25–1.71) had a higher number of kissing-only partners (Table 2). However, compared with men aged ≥35 years, men aged ≤24 years (aIRR = 0.79; 95% CI: 0.63–0.98) and men aged 25–34 years (aIRR = 0.66; 95% CI: 0.55–0.80) had a lower number of sex-only partners (Table 2).

Place of birth

Men born in Europe had the highest number of kissing-only partners (mean = 5.16, SE = 0.24) and men born in Asia had the lowest number of kissing-only partners (mean = 1.61, SE = 0.16) in the last 3 months (Table 1). Men born in Europe had significantly more kissing-only partners than men born in Australia or Oceania (aIRR = 1.31; 95% CI: 1.12–1.54) (Table 2). Men born in Europe also had significantly more kissing-with-sex partners than men born in Australia or Oceania (aIRR: 1.25; 95% CI: 1.07–1.46). In contrast, men born in Asia had the highest number of sex-only partners, which was significantly greater than men born in Australia or Oceania (aIRR: 2.23; 95% CI: 1.74–2.86) (Table 2).

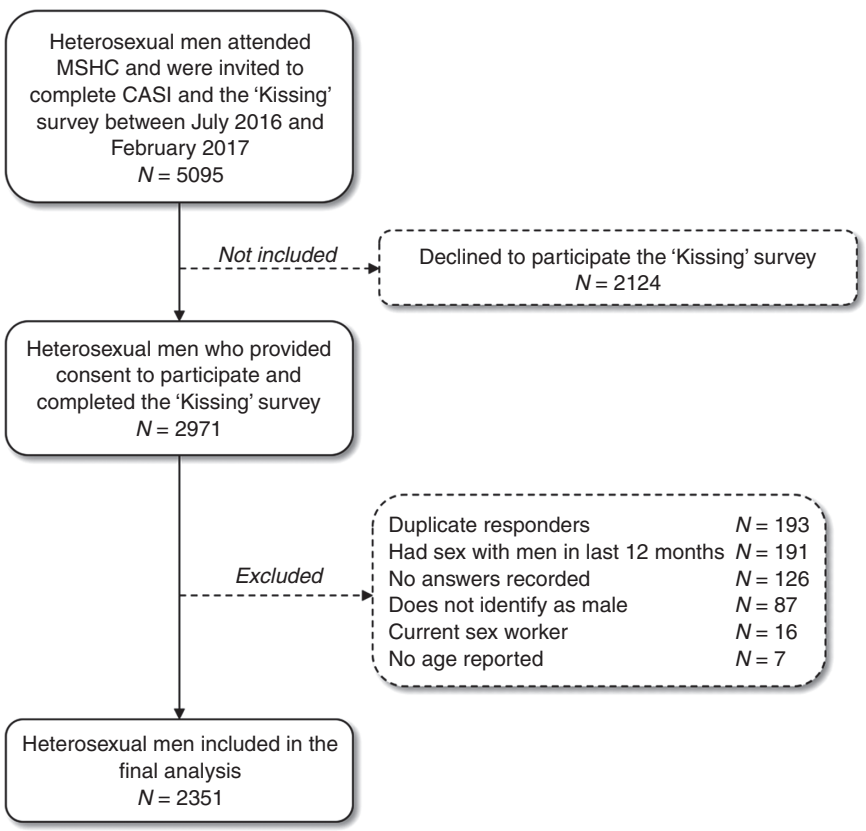

Fig. 1. Flow chart outlining the selection process for final analysis.

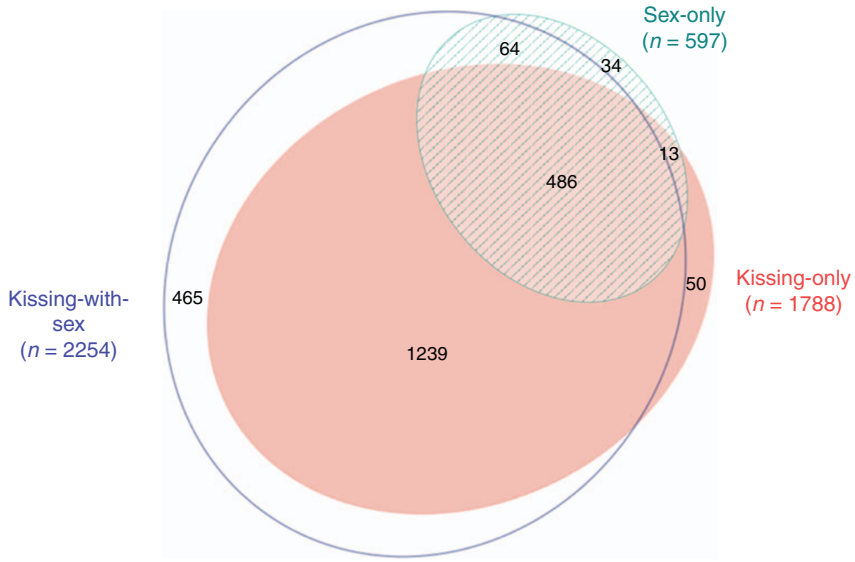

Fig. 2. Scaled 3-Venn diagram representing the variation in kissing and sexual practices for the different types of partners among 2351 heterosexual men in the last 3 months: kissing-only (orange), sex-only (green) and kissing-with-sex (blue) partners.

Table 1. Mean and median number of kissing-only, sex-only and kissing-with-sex partners in the last 3 months among 2351 heterosexual men, stratified by age, place of birth, traveller from overseas/recently arrived status and marital status

Values obtained from: †, univariable negative binomial regression; ‡, multivariable negative binomial regression (adjusted for age, place of birth, traveller or recently arrived status and marital status); ^, Kruskal–Wallis test. §, the overall *P*-value for the categorical variables was presented. SE, standard error; IQR, interquartile range; IRR, incidence rate ratio; CI, confidence interval

		Number of kissing-only partners in the last 3 months			Number of sex-only partners in the last 3 months			Number of kissing-with-sex partners in the last 3 months		
	N (%)	Crude mean (SE)†	Adjusted mean (SE)‡	Median (IQR)	Crude mean (SE)†	Adjusted mean (SE)‡	Median (IQR)	Crude mean (SE)†	Adjusted mean (SE)‡	Median (IQR)
Age (years)										
≤24	564 (24)	4.52 (0.21)	3.89 (0.29)	3 (1–5)	0.57 (0.04)	0.64 (0.07)	0 (0–0)	2.80 (0.14)	2.49 (0.19)	2 (1–4)
25–34	1178 (50)	3.35 (0.11)	3.00 (0.19)	2 (1–4)	0.47 (0.02)	0.54 (0.05)	0 (0–0)	2.98 (0.10)	2.71 (0.17)	2 (1–4)
≥35	609 (26)	1.75 (0.09)	2.02 (0.14)	1 (0–2)	0.61 (0.04)	0.81 (0.07)	0 (0–1)	2.19 (0.11)	2.29 (0.15)	2 (1–3)
All	2351 (100)	2.98 (0.08)	2.87 (0.16)	2 (1–4)	0.54 (0.02)	0.65 (0.05)	0 (0–1)	2.64 (0.07)	2.49 (0.13)	2 (1–3)
P value§	–	<0.001†	<0.001‡	<0.001^	0.006†	<0.001‡	<0.001^	<0.001†	0.034‡	<0.001^
Place of birth										
Australia or Oceania	1147 (49)	2.62 (0.09)	3.10 (0.25)	1 (0–3)	0.41 (0.02)	0.50 (0.06)	0 (0–0)	2.51 (0.09)	2.46 (0.20)	2 (1–3)
Europe	533 (23)	5.16 (0.24)	4.07 (0.32)	3 (1–6)	0.62 (0.04)	0.53 (0.06)	0 (0–0)	3.48 (0.17)	3.08 (0.24)	2 (1–4)
Asia	77 (3)	1.61 (0.16)	1.76 (0.20)	1 (0–2)	0.97 (0.10)	1.12 (0.16)	0 (0–2)	1.95 (0.18)	1.86 (0.21)	1 (1–2)
North America	173 (7)	4.71 (0.54)	3.80 (0.50)	2 (1–6)	0.58 (0.10)	0.50 (0.10)	0 (0–0)	4.23 (0.49)	3.67 (0.49)	3 (1–4)
Latin America or Caribbean	92 (4)	3.02 (0.45)	2.75 (0.44)	2 (1–4)	0.78 (0.15)	0.72 (0.16)	0 (0–1)	2.48 (0.38)	2.29 (0.37)	2 (1–3)
Middle East or Africa	60 (2)	3.22 (0.42)	3.20 (0.46)	2 (1–5)	0.73 (0.13)	0.81 (0.15)	0 (0–1)	2.60 (0.35)	2.39 (0.34)	2 (1–3)
Unknown	269 (11)	2.48 (0.18)	2.14 (0.31)	1 (0–3)	0.44 (0.05)	0.56 (0.12)	0 (0–1)	2.29 (0.17)	2.09 (0.30)	1 (1–3)
P value§	-	<0.001†	<0.001‡	<0.001^	<0.001†	<0.001‡	<0.001^	<0.001†	<0.001‡	<0.001^
Traveller from overseas or recently arrived in Australia[A]										
No	1522 (65)	2.56 (0.08)	2.25 (0.15)	1 (0–3)	0.46 (0.02)	0.57 (0.06)	0 (0–0)	2.54 (0.08)	2.35 (0.16)	2.0 (1–3)
Yes	505 (21)	5.55 (0.27)	3.45 (0.26)	3 (1–7)	0.79 (0.05)	1.09 (0.12)	0 (0–1)	3.52 (0.18)	2.58 (0.19)	2.0 (1–4)
Unknown	324 (14)	2.67 (0.17)	3.04 (0.42)	1 (1–3)	0.44 (0.04)	0.44 (0.09)	0 (0–1)	2.40 (0.16)	2.54 (0.35)	2.0 (1–3)
P value§	–	<0.001†	<0.001‡	<0.001^	<0.001†	<0.001‡	0.132^	<0.001†	0.515‡	<0.001^
Marital status										
Never married	1616 (69)	3.66 (0.10)	3.13 (0.17)	2 (1–4)	0.51 (0.02)	0.57 (0.04)	0 (0–0)	2.96 (0.09)	2.75 (0.15)	2.0 (1–4)
Married or De facto	256 (11)	1.85 (0.14)	2.27 (0.21)	1 (0–2)	0.70 (0.07)	0.77 (0.09)	0 (0–1)	2.04 (0.16)	2.18 (0.20)	1.0 (1–2)
Divorced, widowed, or separated	140 (6)	2.25 (0.23)	3.13 (0.36)	1 (0–2)	0.50 (0.07)	0.53 (0.09)	0 (0–1)	2.29 (0.23)	2.45 (0.28)	2.0 (1–3)
Unknown	339 (14)	2.57 (0.16)	3.13 (0.31)	1 (0–3)	0.51 (0.05)	0.77 (1.1)	0 (0–1)	2.39 (0.15)	2.61 (0.26)	1.0 (1–3)
P value§	–	<0.001†	0.004‡	<0.001^	0.020†	0.015‡	<0.001^	<0.001†	0.069‡	<0.001^

[A]Traveller from overseas or recently arrived status: arrived in Australia from overseas within the last 2 years before completing the survey.

Table 2. Crude and adjusted incidence rate ratios exploring the relationship between kissing-only, sex-only and sex-with-kissing partners in the last 3 months among 2351 and age, place of birth and traveller from overseas/recently arrived status and marital status

IRR, incidence rate ratio; CI, confidence interval; Ref, reference

	Number of kissing-only partners in the last 3 months				Number of sex-only partners in the last 3 months				Number of kissing-with-sex partners in the last 3 months			
	Crude IRR (95% CI)	*P*	Adjusted IRR (95% CI)[A]	*P*	Crude IRR (95% CI)	*P*	Adjusted IRR (95% CI)[A]	*P*	Crude IRR (95% CI)	*P*	Adjusted IRR (95% CI)[A]	*P*
Age (years)												
≤24	2.59 (2.26–2.96)	<0.001	1.93 (1.66–2.25)	<0.001	0.93 (0.77–1.13)	0.474	0.79 (0.63–0.98)	0.035	1.28 (1.12–1.47)	<0.001	1.09 (0.93–1.27)	0.277
25–34	1.92 (1.70–2.16)	<0.001	1.66 (1.25–1.71)	<0.001	0.78 (0.66–0.91)	<0.001	0.66 (0.55–0.80)	<0.001	1.36 (1.21–1.53)	<0.001	1.18 (1.04–1.35)	0.013
≥35	1	Ref	1	Ref	1	Ref	1	Ref	1	Ref	1	Ref
Place of birth												
Australia or Oceania	1	Ref	1	Ref	1	Ref	1	Ref	1	Ref	1	Ref
Europe	1.97 (1.75–2.21)	<0.001	1.31 (1.12–1.54)	0.001	1.49 (1.25–1.77)	<0.001	1.06 (0.83–1.35)	0.642	1.38 (1.23–1.56)	<0.001	1.25 (1.07–1.46)	0.005
Asia	0.62 (0.50–0.75)	<0.001	0.57 (0.46–0.70)	<0.001	2.34 (1.84–2.96)	<0.001	2.23 (1.74–2.86)	<0.001	0.78 (0.64–0.95)	0.012	0.76 (0.62–0.92)	0.006
North America	1.79 (1.42–2.27)	<0.001	1.23 (0.95–1.59)	0.120	1.39 (0.98–1.99)	0.066	1.00 (0.67–1.49)	0.990	1.68 (1.33–2.13)	<0.001	1.49 (1.15–1.94)	0.003
Latin America or Caribbean	1.15 (0.85–1.55)	0.361	0.89 (0.65–1.22)	0.463	1.90 (1.28–2.82)	0.002	1.43 (0.93–2.19)	0.101	0.99 (0.73–1.34)	0.940	0.93 (0.67–1.28)	0.660
Middle East or Africa	1.23 (0.94–1.60)	0.129	1.03 (0.79–1.36)	0.805	1.76 (1.23–2.52)	0.002	1.62 (1.10–2.37)	0.013	1.03 (0.79–1.36)	0.811	0.97 (0.74–1.29)	0.848
Unknown	0.94 (0.81–1.10)	0.470	0.69 (0.47–1.02)	0.065	1.05 (0.83–1.34)	0.679	1.13 (0.63–2.03)	0.688	0.91 (0.78–1.07)	0.244	0.85 (0.58–1.26)	0.416
Traveller from overseas or recently arrived in Australia[B]												
No	1	Ref	1	Ref	1	Ref	1	Ref	1	Ref	1	Ref
Yes	2.16 (1.94–2.42)	<0.001	1.53 (1.31–1.80)	<0.001	1.72 (1.47–2.01)	<0.001	1.91 (1.51–2.42)	<0.001	1.38 (1.23–1.55)	<0.001	1.10 (0.93–1.29)	0.258
Unknown	1.04 (0.91–1.20)	0.568	1.35 (0.98–1.86)	0.065	0.96 (0.77–1.19)	0.709	0.77 (0.47–1.27)	0.303	0.94 (0.82–1.09)	0.417	1.08 (0.78–1.49)	0.640
Marital status												
Never married	1	Ref	1	Ref	1	Ref	1	Ref	1	Ref	1	Ref
Married or De facto	0.51 (0.43–0.60)	<0.001	0.73 (0.61–0.87)	<0.001	1.39 (1.13–1.71)	0.002	1.35 (1.08–1.70)	0.010	0.69 (0.59–0.81)	<0.001	0.79 (0.67–0.94)	0.009
Divorced, widowed, or separated	0.62 (0.50–0.76)	<0.001	1.00 (0.80–1.25)	0.995	0.99 (0.73–1.33)	0.929	0.94 (0.68–1.31)	0.725	0.77 (0.63–0.95)	0.015	0.89 (0.71–1.11)	0.305
Unknown	0.70 (0.61–0.81)	<0.001	0.97 (0.77–1.21)	0.778	1.01 (0.82–1.23)	0.946	1.37 (1.00–1.87)	0.050	0.81 (0.70–0.93)	0.003	0.95 (0.76–1.18)	0.625

[A]Adjusted for age, place of birth, traveller/recently arrived status and marital status.

[B]Traveller from overseas or recently arrived from overseas in Australia within the last 2 years before completing the survey.

Traveller or recently arrived status

Men who were travellers or recently arrived in Australia had a higher number of kissing-only and sex-only partners (mean = 5.55 (SE = 0.27) and mean = 0.79 (SE = 0.05), respectively) than non-travellers (mean = 2.56 (SE = 0.08) and mean = 0.46 (SE = 0.02), respectively). Travellers or men who recently arrived in Australia had significantly more kissing-only partners (aIRR: 1.53; 95% CI: 1.31–1.80) and sex-only partners (aIRR: 1.91; 95% CI: 1.51–2.42) compared with men living in Australia for a longer period of time (Table 2). However, the number of kissing-with-sex partners did not differ between travellers and non-travellers after adjusting for age, place of birth and marital status (Table 2).

Marital status

Men who were never married had a higher number of kissing-only partners (mean = 3.66, SE = 0.10) compared with men who were married or in a de facto relationship (mean = 1.85, SE = 0.14). In contrast, men who were never married had a lower number of sex-only partners (mean = 0.51, SE = 0.02) compared with men who were married or in a de facto relationship (mean = 0.70, SE = 0.07) (Table 1). Married or de facto men had significantly fewer kissing-only partners (aIRR: 0.73; 95% CI: 0.61–0.87) and kissing-with-sex partners (aIRR: 0.79; 95% CI: 0.67–0.94) compared with those who identified as never married. However, married heterosexual men had significantly more sex-only partners than those never married (aIRR: 1.35; 95% CI: 1.08–1.70).

Discussion

This cross-sectional survey provides novel data about kissing, in the presence or absence of sex, in heterosexual men. We found that kissing-only represents a substantial proportion of previously unmeasured intimate contact between heterosexual men and women. There were significant differences in kissing and sex practices noted among men with different demographic backgrounds such as age, place of birth, marital status and travel status. Further research investigating these practices is important, given that recent work has implicated kissing as a potential route of transmission for oropharyngeal gonorrhoea not only for MSM but also in heterosexuals.[1,14–16] If kissing does prove to be as important in the transmission of *Neisseria gonorrhoeae*, as it is for *Neisseria meningitides*,[21] then measuring kissing practices should be part of studies assessing sexual risk and should be included in future research.

There are several potential explanations as to why the number of kissing-only partners decrease with age. First, kissing is often the first sexual practice in which adolescents and young adults engage.[22] A US study found that 85% of university-aged heterosexual men and women had ever engaged in any sexual or romantic kissing during their lifetime.[23] Therefore, having relatively more kissing-only partners at a younger age may reflect an ongoing development of the sexual repertoire that occurs into adulthood.[24,25] Second, it is also possible that differences in attitudes and motives towards sexuality and intimacy among older age groups, such as a decreased emphasis on sexual and relational motives for kissing, along with changing relationship structures (e.g. higher rates of marriage), is contributing to the reduction in kissing-only partners with increasing age.[26] Whatever the reason for the decrease in the number of kissing-only partners with age in heterosexual men, this is consistent with a previous study demonstrating that the number of kissing-only partners also decreases with increasing age among MSM.[1] This demonstrates that age, likely independent of sexual orientation, is an important factor that influences the number of kissing-only partners among men.

We also found significant differences in the number of kissing-only partners among men with a different place of birth. It is possible that the practice of kissing may be related to some ethnic and cultural factors. Our findings suggest that heterosexual men who were born in Asia had the fewest kissing-only partners compared with non-Asian men. This finding is consistent with a previous study conducted in the US, which has revealed that young Asian-American men are less likely to have kissed a partner than men from other ethnic backgrounds.[23,27] The disparities in sexual expression may be due to the differences in socialisation patterns and cultural norms between ethnic groups.[28] Although further research is warranted to clarify the effect of place of birth on kissing practices, we have demonstrated that kissing is unlikely to occur at the same frequency across ethnic and cultural groups.

Our findings show that travellers have a higher number of kissing-only, sex-only and kissing-with-sex partners compared with locals or non-travellers. Past studies have also demonstrated that travellers are at a higher risk of HIV and STI as they are more likely to seek casual sex during travel.[29–31] However, we were unable to distinguish between men who had recently arrived in Australia who were ‘backpackers’ and those who were here for other purposes (e.g. international students) in our dataset, as this information was not collected. This distinction is important because one could imagine that individuals who are travelling and staying in backpacker accommodation may have more time and opportunity for kissing than those studying and living in other forms of accommodation (e.g. an apartment).[32] In Australia, backpackers are primarily from Europe,[33] whereas international students are primarily from Asia,[34] and this may have therefore influenced our findings because we were not able to adequately account for this information in the adjusted analysis.

There are several limitations in this study. First, our study population may not be generalisable to the broader heterosexual population because men were recruited from a single urban sexual health clinic in Melbourne, Australia. It is possible that there is a potential difference in sexual practices between men attending a sexual health clinic and men in the wider community. Furthermore, the response rate of 46% may have potentially biased our results, due to the presence of systemic and unmeasured differences between participants and non-participants. Although participants were more likely to be from Australia or Oceania, the mean age and chlamydia positivity did not differ between the participants and non-

participants, which suggests the participants were relatively representative of the clinic population. Second, we included questions asking about sexual practices in the last 3 months before the survey, which may have resulted in the responses being subject to recall bias. In addition, men who kissed other men in the last 3 months may have been included in the responses because the definition of 'heterosexual' in our study only excluded men who have sexual contact with men (i.e. oral or anal sex), which does not necessarily encompass kissing. Furthermore, we were unable to determine whether there were any differences between regular and casual partners in relation to kissing-only, sex-only and kissing-with-sex practices because information on the type of partnership was not collected in this study. Third, our measurement of travel was imprecise because it did not allow us to accurately differentiate between those migrating to Australia and those temporarily travelling to Australia from overseas. This definition of travel was further limited because we did not investigate the travel history of local Australians. Therefore, cautions must be taken when interpreting the data on travellers from overseas or recently arrived in Australia. Finally, we did not measure all factors that may influence kissing practices (e.g. drug and alcohol use, and ways of seeking partners) and therefore, there is likely to be unmeasured confounding operating in our study.[35–37]

However, our study has several strengths. Kissing-only, in the absence of other sexual practices, was, to our knowledge, specifically addressed for the first time in heterosexuals. We found that heterosexual men have a similar, if not a higher, number of kissing-only partners than kissing-with-sex partners. Therefore, studies and surveys that fail to ask about kissing, in the absence of other sexual practices, might fail to identify a large number of intimate encounters between heterosexual men and women. We were also able to quantify the number of kissing and sex partners in the context of a range of demographic variables to demonstrate that numerous factors, such as age and place of birth, have a significant effect on the pattern of kissing and sex practices.

This study is relevant to future research, including national sex surveys, as kissing-only partners represent a substantial proportion of previously unmeasured intimate contact between heterosexual men and women. This is particularly relevant to the recent rises in gonorrhoea have been reported among Australian heterosexuals. In addition, data have suggested that oropharyngeal gonorrhoea is not uncommon in heterosexuals, but the risk factors for oropharyngeal gonorrhoea are not well understood.[12,38–40] There has been only one observational study identifying kissing as an independent risk factor for gonorrhoea transmission in MSM;[1] however, there has been no study investigating heterosexuals yet. Clinical trials on antiseptic mouthwash for oropharyngeal gonorrhoea prevention among MSM is currently underway in Australia (clinical trial code: ACTRN12616000247471; https://www.anzctr.org.au/Trial/Registration/TrialReview.aspx?id=370087, accessed 1 June 2020)[41] and in Belgium (clinical trial code: NCT03881007; https://clinicaltrials.gov/ct2/show/NCT03881007, accessed 1 June 2020). If antiseptic mouthwash works, findings from the clinical trials can be translated into a public health mouthwash campaign and this can be extended to other populations such as sex workers and heterosexuals.[42]

Conflicts of interest

Eric P. F. Chow is a joint editor and Christopher K. Fairley is an editor for *Sexual Health*. The authors declare no conflicts of interest.

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