CSIRO PUBLISHING
Sexual Health
https://doi.org/10.1071/SH18216

High levels of engagement with testing for HIV and sexually transmissible infection among gay Asian men in Sydney and Melbourne: an observational study

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Abstract. ***Background*:** Gay and other men who have sex with men of Asian background (GAM) have been identified as a key population in efforts to eradicate HIV in New South Wales. The aims of the present study were to evaluate current levels of engagement with HIV and sexually transmissible infection (STI) testing services, assess knowledge of pre- and post-exposure prophylaxis and to identify factors associated with service engagement in this group. ***Methods*:** A survey of 604 GAM residing in Sydney and Melbourne was undertaken. ***Results*:** The data identified that a significant proportion of non-HIV-positive men (i.e. HIV-negative men and men whose HIV status was unknown) surveyed ($n = 567$; 93.9%) had engaged in frequent HIV testing and comprehensive STI testing in the 12 months prior to the survey ($n = 180$; 31.7%). There were significant differences ($P < 0.05$) in sexual practices at the bivariate level between those who reported frequent and comprehensive HIV/STI testing and those who did not. Those who tested regularly were substantially more sexually active, were more likely to have multiple partners ($P = 0.001$) and were more likely to engage in condomless anal intercourse with both casual ($P < 0.001$) and regular ($P = 0.002$) partners. Those who engaged with testing initiatives were more likely to discuss HIV status with both regular ($P = 0.008$) and casual ($P < 0.001$) partners, and identified more reasons to test than their counterparts ($P < 0.001$). The data also highlighted key service venues, with gay men most likely to have used public sexual health clinics (46.9%) as their most recent testing venue. ***Conclusions*:** The data demonstrate an association between high levels of male-to-male sexual activity and engagement in frequent and comprehensive HIV and STI testing. This likely derives from both self-perceived notions of risk and current reliance on established gay community organisations to convey information around testing. Increasing engagement with testing initiatives beyond GAM who self-identify as being at high HIV and STI risk will require the use of novel routes by which to disseminate this information.

Additional keywords: Australia, homosexual, men who have sex with men, New South Wales, Victoria.

Received 27 November 2018, accepted 26 August 2019, published online 3 March 2020

Introduction

Gay and other men who have sex with men (MSM) of Asian background (GAM) are emerging as a pivotal group in efforts to eradicate HIV in Australia. Once a seemingly unassailable target, ending HIV transmission is now a realistic prospect in some Australian states. One such state is New South Wales (NSW), a region in which a robust HIV prevention strategy has led to the stabilisation of notification rates in the general population.[1] Having achieved the 90–90–90 goals set out by UNAIDS,[2] NSW Health has now targeted the virtual elimination of HIV transmission in the state by 2020.[1] There is growing recognition that if this is to be attained, a focused approach to combat HIV acquisition in high-risk populations is key.

Although MSM have long been recognised as a priority population in HIV prevention efforts, we are yet to fully characterise the impact of ethnicity on the care-seeking behaviour of this inherently heterogeneous population. This has clear relevance in NSW today, with surveillance data highlighting diverging trends in notification rates between MSM of different ethnic backgrounds.[1,3] This reflects trends seen on a national level: Australia-wide, data indicate that although the number of notifications involving Australian-born MSM is trending downward, notifications relating to overseas-born MSM continue to increase.[3] Indeed, available data from 2017 and the first quarter of 2018 indicate that the number of new HIV diagnoses in NSW pertaining to overseas-born MSM over this period exceeded that of their Australian-born counterparts for the first time.[1,4] Both local and national data suggest that MSM of Asian origin account for an increasingly large proportion of new diagnoses among overseas-born MSM, with GAM accounting for 40% of such diagnoses in NSW in the first quarter of 2018.[4] If we are to achieve the goals set out by NSW Health, the importance of a nuanced approach to the growing HIV epidemic in this group is clear.

GAM constitute a dynamic and highly heterogeneous population, whose attitudes to sex, sexuality, and sexually transmissible infections (STIs) have changed rapidly in recent years. These changes seem to be driven, at least in part, by the changing demographic profiles and sexual repertoires of Asian-born migrants to Australia. New Asian gay-identified male migrants to Australia are often young, and are increasingly more gay community aware and sexually active than their predecessors.[5,6] This reflects a wider shift in social attitudes in the Asia–Pacific region, with increasing visibility of movements promoting the acceptance of homosexuality within Asian communities.[6] This societal shift has been accompanied by continued development of HIV services in the region, with increasing availability of affordable and effective antiretroviral therapies (ART) and scaled-up access to home-based and rapid point-of-care testing for HIV.[7,8] These cultural changes come at a time of population-wide behavioural change, with GAM in Australia now participating in condomless anal intercourse in similar numbers to Australian-born MSM.[6]

Gay Asian communities in Australia are in flux; understanding how changing cultural norms inform engagement with health services is key to designing appropriate sexual health care for this group. Fully characterising the drivers of and barriers to service engagement within this subgroup will allow us to design services in a way that meets the needs of this increasingly key population, and ultimately to combat the small but growing HIV epidemic in this group. This study aimed to assess the current extent to which GAM engage with clinical services and their knowledge and use of pre- and post-exposure prophylaxis (PrEP and PEP respectively). Further, the study explored the facilitators of and barriers to frequent HIV testing and comprehensive STI testing in this group, and the implications therein for future service design.

Methods

Periodic cross-sectional behavioural surveillance of gay communities has been regularly conducted in Australian capital cities and other densely populated regions since 1996.[9] The data for this study were drawn from the round of surveillance conducted between 1 November 2015 and 31 December 2016. The survey design was modelled on the 1999 and 2002 GAM surveys, using both questions sourced from the Sydney Gay Men's Periodic Survey (GCPS) and additional questions specifically pertaining to GAM. A full report from the 2015–16 Sydney Gay Asian Men Survey can be freely downloaded from https://csrh.arts.unsw.edu.au/media/CSRHFile/20156_Sydney_Gay_Asian_Men_Survey.pdf (accessed 16 November 2019).

Recruitment utilised both online (n = 183 (30.3%); including 114 Sydney-based participants and all 69 Melbourne-based participants) and offline (Sydney only; n = 421) strategies. The use of an online platform was novel to this round of data collection, allowing us to reach participants across multiple locations for the first time. Offline recruitment was carried out at Sydney-based community venues and events (gay and non-gay related; n = 90; 14.9%), public-funded sexual health clinics and peer-based community testing sites (n = 162; 26.8%) and sex-on-premises venues (n = 169; 28.0%). The survey was made available to online participants in English only, with a Thai translation of the survey also available to face-to-face recruits. The four main target groups were Chinese, Thai, Filipino and other South-east or South Asian men, identified on the basis of the NSW Health HIV notification data. The questionnaire was for self-completion, with no compensation provided. The average time of completion was estimated to be 10–15 min, with an

estimated response rate of around 40–50%. For the purposes of the survey, 'frequent' HIV testing was defined as a minimum of two tests in the preceding 12 months, with 'comprehensive' STI testing defined as a minimum of one throat swab, one anal swab, one urine sample and one blood test either for syphilis or for other STIs (excluding HIV) over the same period.

Data were analysed through descriptive analysis, and bivariate analyses (i.e. cross-tabs, *t*-tests and Mann–Whitney *U*-tests, where appropriate) were used to examine subgroup differences. For multivariable logistic regression analysis, a hierarchical backward model reduction strategy was used. In the initial regression model, key demographic variables were entered as a block, followed by variables that were statistically significant at the bivariate level after being grouped into a range of blocks (e.g. sexual relationships, sexual practices, HIV and STI testing-related variables, PEP and PrEP). For parsimony, the final reduced regression model contains variables that were independently associated with men who underwent frequent HIV and comprehensive STI testing. Nagelkerke R^2 and Hosmer–Lemeshow $\chi 2$ results were used to demonstrate the fitness of the final model (for details, see the Results section, subgroup comparisons). All data analyses were conducted in IBM SPSS v23 (IBM Corp., Armonk, NY, USA), with two-sided $P < 0.05$ considered significant.

Ethics approval for this study was obtained from UNSW Sydney, ACON and the Victorian AIDS Council.

Results

As indicated in Table 1, the sample was largely comprised of men from four ethnic groups: (1) Chinese men, including those from Hong Kong, Macau and Taiwan (n = 249; 41.2%); (2) Filipino men (n = 74; 12.3%); (3) Thai men (n = 62; 10.3%); and (4) other South Asian men, including those from India, Pakistan, Bangladesh and Sri Lanka (n = 79; 13.1%). The remaining 28.6% of men were from other Asian and Pacific countries. Close to half were born overseas but had lived in Australia for more than 5 years (n = 297). Although the majority self-identified as gay (88.2%; n = 533), 9.7% identified as bisexual (n = 59) and 2.0% identified as heterosexual (n = 4) or other (n = 12; Table 1). The sample consisted of substantially younger men (median age 30 years, interquartile range (IQR) 25–37 years; range 18–65 years) than the conventional Sydney GCPS participants (median age 33 years, IQR 26–43 years; range 16–83 years).

Engagement with HIV and STI testing, PEP and PrEP

Over 90% of the men reported their HIV status as known to be either negative (n = 517; 85.6%) or positive (n = 37; 6.1%). Of the 567 'non-HIV-positive' men (517 HIV-negative men plus another 50 men whose HIV status was unknown), 525 (92.6%) had ever been tested for HIV. Of these 525 men, 85.9% (n = 451) had been tested for HIV within 12 months of the survey, including 144 men (27.4%) who had three or more tests during this period. The three most common sites for men to have had their latest HIV test were public-funded sexual health clinics (n = 246; 46.9%), associated community-based peer testing sites (n = 101; 19.2%) and general practices (n = 96; 18.3%). Furthermore, of the 525 non-HIV-positive men who

Table 1. Demographics of the study population (n = 604)
Data are given as n (%)

Age (years)	
18–24	113 (18.7)
25–29	177 (29.3)
30–39	192 (31.9)
40–49	92 (15.2)
50–59	25 (4.1)
60–65	3 (0.5)
Gender	
Male	589 (97.7)
Female-to-male transgender	14 (2.3)
Sexual identity self-identification	
Gay or homosexual	533 (88.2)
Bisexual	59 (9.7)
Other (heterosexual, no label)	12 (2.0)
Sexual attraction	
Men only	542 (89.7)
Both men and women	58 (9.6)
Women only	4 (0.7)
Self-reported ethnic background	
Chinese[A]	249 (41.2)
Filipino[B]	74 (12.2)
Thai	62 (10.3)
Vietnamese	61 (10.1)
Indian[C]	46 (7.6)
Other South-east Asian[D]	79 (13.1)
Other North Asian (Japanese, Korean)	25 (4.1)
Other Asian	8 (1.3)
Country of birth	
China[E]	146 (24.2)
Australia	83 (13.8)
Philippines	68 (11.3)
Thailand	60 (9.9)
Indonesia	53 (8.8)
Vietnam	49 (8.1)
Countries in South Asia (India, Pakistan, Bangladesh)	31 (5.1)
Other countries in South-east Asia[F]	75 (12.4)
Other countries in North Asia (Japan, Korea)	22 (3.6)
Other	16 (2.7)
Length of stay (years) in Australia for those born overseas (n = 517)	
<1	66 (12.8)
1–2	86 (16.6)
3–5	68 (13.2)
>5	297 (57.4)
Area of residence (Sydney, n = 535; Melbourne, n = 69)	
Sydney (urban gayborhood)	49 (8.1)
Sydney (other urban)	446 (73.8)
Melbourne (urban gayborhood)	19 (3.1)
Melbourne (other urban)	45 (7.5)
Other (regional, rural or other parts of Australia)	45 (7.5)
Employment	
Full-time	279 (46.2)
Student	165 (27.3)
Other (part-time, self-employed, unemployed)	160 (26.5)
Education (highest level completed)	
University or above	465 (77.1)
Tertiary diploma or trade certificate	69 (11.4)
Up to high school	69 (11.4)
General health being very good or good	486 (80.4)
Spending a lot of spare time with gay friends	138 (25.7)
Spending a lot of spare time with friends of the same ethnic background	170 (31.7)

Table 1. (*continued*)

Any stigma related to being a minority based on ethnicity, sexuality or religious or spiritual affiliation	321 (53.1)
Source of recruitment	
Sydney	
Gay community organisation (ACON)-related social venues and events	52 (8.6)
Other non-gay community-specific social venues and events	38 (6.3)
Sex-on-premise venues	169 (28.0)
Sexual health clinics	79 (13.1)
Community-based (ACON) peer testing sites	83 (13.7)
Online	114 (18.9)
Melbourne	
Online	69 (11.4)

[A]Including people from the Chinese mainland, Hong Kong, Macau and Taiwan, as well as people of Chinese mixed heritage.
[B]Including those of Filipino mixed heritage.
[C]Including people from Pakistan, Bangladesh and Sri Lanka.
[D]Including people from Indonesia, Malaysia, Cambodia, Singapore, Nepal, Laos and Burma/Myanmar.
[E]Including mainland China, Hong Kong, Macau and Taiwan.
[F]Malaysia, Singapore, Laos, Nepal, Cambodia, Sri Lanka and Myanmar.

had ever tested for HIV, 75.2% (n = 395) had been tested for other STIs in the previous 12 months, with 89 men (17.0%) reporting at least one confirmed STI diagnosis during this period. The three most commonly cited reasons for engaging in testing were 'I want to know my HIV status' (80.4%), 'It's part of my regular health checking' (56.3%) and 'I have had condomless sex with other men' (27.9%).

Participants were reasonably aware of the latest biomedical prevention technologies. Among the 525 non-HIV-positive men who had ever tested for HIV, over two-thirds (n = 357; 68.0%) knew of the current availability of PEP, with 43 men (8.2%) having used it in the preceding 6 months. On a comparatively smaller scale, over half (n = 286; 54.5%) of the 525 men were aware of the current availability of PrEP, with 23 men (4.4%) having used it in the 6 months before the survey.

Subgroup comparisons

The 567 non-HIV-positive gay and bisexual men were divided into two groups: those who had frequent HIV tests and comprehensive STI testing within 12 months before the survey (Group 2; n = 180; 31.7%) and those who had not (Group 1; n = 387). As indicated in Table 2, there were statistically significant differences (at $P < 0.05$) in sexual

Table 2. Bivariate differences in sexual relationships and practices with other men for non-HIV-positive men (i.e. HIV-negative men and men whose HIV status was unknown)

Unless indicated otherwise, data are given as n (%). Group 1, men who did not undertake frequent HIV and comprehensive sexually transmissible infection (STI) testing in the year before the survey; Group 2, men who undertook frequent HIV and comprehensive STI testing in the year before survey

	Group 1 (n = 387)	Group 2 (n = 180)	P-value
Current relationship status			0.001
No male sex partner or no sex with men	69 (17.8)	14 (7.8)	
Monogamy	82 (21.2)	26 (14.4)	
Casual male partners only	130 (33.6)	71 (39.4)	
Regular and casual male partners	106 (27.4)	69 (38.3)	
No. male sex partners in the previous 6 months (combined here for reporting)			<0.001
0–1	111 (28.8)	17 (9.4)	
2–5	138 (35.8)	60 (33.0)	
6–10	72 (18.7)	36 (20.0)	
>10	65 (16.8)	67 (37.2)	
No. online or offline approaches taken to find other male sex partners in the previous 6 months			<0.001
Median	1	2	
Interquartile range	1–2	1–3	
Engaged in group sex in the previous 6 months	95 (24.5)	73 (40.6)	<0.001
Sex with the main or regular partner in the previous 6 months			0.002
No partner or no sex	155 (40.1)	71 (39.4)	
No anal intercourse	69 (17.8)	17 (9.4)	
Consistent condom use during anal intercourse	73 (18.9)	26 (14.4)	
Any condomless anal intercourse	90 (23.3)	66 (36.7)	
Sex with any casual partners in the previous 6 months			<0.001
No partner or no sex	114 (29.5)	20 (11.1)	
No anal intercourse	57 (14.7)	12 (6.7)	
Consistent condom use during anal intercourse	138 (35.7)	63 (35.0)	
Any condomless anal intercourse	78 (20.2)	85 (47.2)	
Main or regular partner's HIV status			0.008
HIV negative	123 (53.0)	71 (65.1)	
HIV positive	3 (1.3)	5 (4.6)	
HIV status unknown	106 (45.7)	33 (30.3)	
HIV status disclosure before sex with casual partners in the previous six months			
Always disclosed by others	28 (10.3)	41 (25.6)	<0.001
Always disclosed to others	49 (17.9)	54 (33.8)	<0.001
Used any party drugs for sex in the previous 6 months	31 (8.0)	39 (21.7)	<0.001

practices at the bivariate level between the two subgroups. Compared with Group 1, men in Group 2 were substantially more sexually active: they were more likely to have multiple regular or casual male partners ($P = 0.001$) and to have had more than 10 male partners in the 6 months before survey ($P < 0.001$). Group 2 participants also reported using more approaches (either online or offline) to find male partners in the previous 6 months (Group 2 median = 2 vs Group 1 median = 1; $P < 0.001$). Further, Group 2 participants were more likely to participate in condomless anal intercourse with both casual ($P < 0.001$) and regular partners ($P = 0.002$). Group 2 participants were more likely to have engaged in group sex ($P < 0.001$) and to report the use of party drugs for sex in the preceding 6 months ($P < 0.001$). Men in Group 2 were also more likely than their Group 1 counterparts to know their current regular partner's HIV status ($P = 0.008$) and to have shared information about HIV status during casual sexual encounters in the 6 months before survey ($P < 0.001$).

As indicated in Table 3, there were statistically significant differences (at $P < 0.05$) in HIV- and STI-related clinical service engagement at the bivariate level between the two subgroups. Compared with Group 1, men in Group 2 were significantly more engaged with HIV and STI testing, with Group 2 participants self-identifying more reasons to test than their Group 1 counterparts ($P < 0.001$). Although Group 2 participants most frequently reported having used sexual health clinics or associated community-based peer testing sites ($P < 0.001$) for their latest HIV test, they were also more likely than Group 1 to have multiple channels through which to obtain HIV and STI knowledge ($P < 0.001$). Group 2 participants were more likely to know about the current availability of PEP ($P < 0.001$) and PrEP ($P = 0.017$), with a higher proportion of them reporting use of PEP ($P = 0.001$) and PrEP ($P < 0.001$) in the preceding 6 months.

For the multivariable logistic regression analysis, key sociodemographic variables and variables that were statistically significant at the bivariate level were entered into the initial model. As indicated in Table 4, the final reduced model suggests that the factors independently associated with frequent HIV and comprehensive STI testing in our sample included having more male partners (adjusted odds ratio (aOR) 1.22; 95% confidence interval (CI) 1.02–1.45; $P = 0.03$) and engaging in condomless anal intercourse with regular (aOR 1.26; 95% CI 1.06–1.49; $P = 0.007$) or casual (aOR 1.71; 95% CI 1.36–2.15; $P < 0.001$) male partners in the 6 months before survey. Furthermore, having one's latest HIV testing at a sexual health clinic (aOR 8.48; 95% CI 3.63–19.8; $P < 0.001$), followed by an associated community-based peer testing site (aOR 7.99; 95% CI 3.21–19.9; $P < 0.001$) and finally a general practice (aOR 4.16; 95% CI 1.61–10.8; $P < 0.001$) were associated with frequent and comprehensive testing, as was knowledge of the current availability of PEP (aOR 2.44; 95% CI 1.50–3.98; $P < 0.001$). Finally, spending less time with people from the same ethnic background (aOR 0.74; 95% CI 0.59–0.93; $P = 0.01$) was independently associated with increased HIV testing and comprehensive STI testing in this study. The Nagelkerke R^2 for the final reduced model was 0.324 (Hosmer and Lemeshow test, $\chi 2$ 6.67, d.f. = 8).

Discussion

The findings of the present study demonstrate that a significant proportion of gay men (i.e. over one-third of the non-HIV-positive gay and bisexual men in this sample) maintain a regular pattern of HIV and STI screening once linked to a sexual health service. This was particularly so for those at increased risk of potential HIV and STI transmission, making them eligible for any future scale-up of PrEP access. Supporting and expanding

Table 3. Bivariate differences in HIV and sexually transmissible infection (STI) clinical service engagement for non-HIV-positive men (i.e. HIV-negative men and men whose HIV status was unknown)

Unless indicated otherwise, data are given as *n* (%). Group 1, men who did not undertake frequent HIV and comprehensive STI testing in the year before the survey; Group 2, men who undertook frequent HIV and comprehensive STI testing in the year before survey; PrEP, pre-exposure prophylaxis; PEP, post-exposure prophylaxis

	Group 1 (n = 387)	Group 2 (n = 180)	P-value
No. HIV or STI information channels			<0.001
Median	1	2	
Interquartile range	0–3	1–4	
Sites of latest HIV test			<0.001
Sexual health clinics	139 (36.4)	107 (59.4)	
General practices	73 (19.1)	23 (12.8)	
Hospital (in- or outpatient)	52 (13.6)	7 (3.9)	
Community-based peer testing sites	58 (15.2)	43 (23.9)	
Tested elsewhere (including private homes, overseas)	19 (4.9)	0	
No HIV test or 'don't know'	41 (10.7)	0	
No. reasons for HIV testing			<0.001
Median	2	3	
Interquartile range	1–3	2–4	
Knowledge of current availability of PEP	210 (54.3)	147 (81.7)	<0.001
Use of PEP in the previous 6 months (n = 357)	15 (7.1)	28 (19.0)	0.001
Knowledge of current availability of PrEP	182 (47.0)	104 (57.8)	0.017
Use of PrEP in the previous 6 months (n = 286)	6 (3.3)	17 (16.3)	<0.001

Table 4. Factors independently associated with frequent HIV and comprehensive sexually transmissible infection (STI) testing among HIV-positive men
OR, odds ratio; CI, confidence interval; PEP, post-exposure prophylaxis

	Adjusted OR (95% CI)	*P*-value
No. male sex partners in the previous 6 months	1.22 (1.02–1.45)	0.03
Anal intercourse with the main or regular male partner in the previous 6 months	1.26 (1.06–1.49)	0.007
Anal intercourse with any casual male partners in the previous 6 months	1.71 (1.36–2.15)	<0.001
Latest HIV testing sites		
General practices	4.16 (1.61–10.8)	<0.001
Sexual health clinics	8.48 (3.63–19.8)	<0.001
Community-based peer testing sites	7.99 (3.21–19.9)	<0.001
Knowing PEP availability	2.44 (1.50–3.98)	<0.001
Spending spare time with people from the same ethnic background	0.74 (0.59–0.93)	0.01

these gay-friendly sexual health services (both clinic based and community peer led) should be a priority moving forward.

The findings also demonstrate a clear association between high levels of sexual activity and frequent and comprehensive HIV and STI testing at the individual level. Analysis of the sample indicated that those GAM who engaged with testing services were more likely than their counterparts to exhibit a behavioural profile that resonates with traditional ideas of 'high-risk' sexual behaviour. That is, those who tested frequently were more likely to have a higher number of sexual partners and engage in multiple male partnerships. They were also more likely to partake in condomless sex, enjoy group sex and to use drugs for sex, behaviours that have long been identified as risk factors for HIV transmission.[10] This resonates with the findings of previous studies looking at MSM more generally.[11]

Understanding what underpins this association between high levels of sexual activity and an increased propensity to test is complex. In the present study, men who tested frequently for HIV identified more reasons why they should test than their non-testing counterparts, suggesting perhaps that these men self-identify as being 'at risk' of HIV or STI infection because of the behaviours they engage in. Indeed, this resonates with studies conducted internationally, which have also demonstrated an association between the perception of one's risk HIV acquisition and engagement in testing among MSM.[12,13]

It may also be that GAM who are more sexually active are, as a consequence, more likely to encounter and build connections within the local gay community. The discourse around HIV awareness in NSW is well developed, with information primarily disseminated through a robust framework of gay organisations, venues and networks.[6] It seems logical then that men who are more socially engaged with local gay men and gay community networks are more likely to be exposed to this narrative, and are thus more likely to engage with testing norms as mandated by their gay community peers.

Findings for Group 2 participants contrasted markedly with the data from the Group 1 participants, who were not only less likely to test regularly, but were also less likely to seek knowledge as to the status of their partners. Group 1 participants exhibited a different behavioural profile to those in Group 2: they were more likely to be monogamous, had fewer partners and were less likely to partake in condomless sex or use drugs for sex. Fully understanding this association is beyond the scope of this paper, however the continuing role of intersectional and internalised stigma as a barrier to engagement with the gay community must be recognised. Further prejudice on account of race may also be experienced when interacting with gay networks, with this combination of cultural homophobia and sexual racism combining to make access to gay community resources difficult for some.[14,15]

The potential health impact of such stigma is clear. GAM living in Australia continue to experience suboptimal HIV care, performing poorly across a wide spectrum of care quality indicators. This group is more likely than Australian-born counterparts to experience delays in both diagnosis and the initiation of ART, experience viral rebound after treatment is started and is more frequently lost to follow-up.[16,17] Indeed, those of South Asian descent are more likely than any other ethnic group to remain undiagnosed.[3] Furthermore, in an era of increasing access to PrEP, GAM continue to be underrepresented in biomedical prevention trials.[18]

The disparity in outcomes between GAM vs Australian-born MSM is likely multifactorial, with structural barriers such as Medicare ineligibility interacting with often culturally complex social backgrounds to produce marked health inequity. Multilayered stigma and fear of discrimination is exacerbated by social isolation and a lack of culturally competent services to restrict access to appropriate care.[6] This is further complicated for those without permanent residency, who may not have access to affordable care initiatives and whose visa status may act to limit their sexual agency and ability to negotiate safe sexual practices.[19] Temporary visa status in itself may also disincentivise engagement with services due to the potential repercussions of a HIV diagnosis on any subsequent application for citizenship or permanent residency.[20,21] Such considerations interact in a complex and patient-specific manner to shape behaviour, ultimately manifesting in loss of GAM at each step of current HIV prevention and treatment cascades.

Moving forward, the findings of this study highlight the need to expand engagement beyond those who self-identify as being

at risk of infection. It is essential that culturally appropriate health promotion strategies are developed to reach a diverse background of GAM, particularly those yet to establish connections with local services and gay community networks. Current reliance on established networks contributes to the exclusion of these men from the discourse around HIV testing and treatment. Furthermore, it contributes to what is currently a marked service distribution disparity, with resources primarily concentrated in metropolitan areas. The findings of the present study demonstrate a shift away from aggregated 'gaybourhood' living; the expansion of tailored programs beyond metropolitan areas would go some way to addressing current gaps in service provision.

Online platforms may prove a promising avenue to pursue, particularly in reaching men who are relatively mobile (e.g. international students). The findings of this study also demonstrate the positive impact of community and peer-based initiatives in ensuring recruitment of GAM in Sydney and Melbourne. Expansion of peer-led schemes may go some way to enable access for those GAM who do not have established connections with local gay networks, both in a practical sense (e.g. in navigating language barriers and local healthcare delivery systems) and, indeed, by facilitating culturally acceptable access to local services and resources.

The present study has several limitations. Despite our sample being the largest recruitment of GAM in Australia to date, it is part of a repeated cross-sectional behavioural surveillance using a convenience time–location sampling approach and advertised online through gay community organisations. As such, the sample is not fully representative of the population under investigation. Rather, study participants were likely to openly identify as 'gay', reside in metropolitan Sydney or Melbourne and to have been resident in Australia for more than 5 years. It is also of note that the face-to-face recruitment arm covered public sexual health clinics and community testing venues. This may further bias the sample towards identifying a subgroup of GAM already engaged with services. The cross-sectional design of the study also precludes causal determination, with the structured questionnaire approach further limiting our ability to explore relevant contextual factors related to culture-specific beliefs, norms and practices. Finally, these data were collected as part of the 2015–16 data collection cycle; data collected in more recent cycles may provide further insight into this dynamic population.

Understanding the drivers of and barriers to service engagement among GAM is key to Australian HIV prevention strategy moving forward. The findings of the present study demonstrate the existence of a subpopulation that is well embedded in services. The challenge moving forward lies in extending engagement beyond this 'early adopter' group and expanding services to reach those individuals who may not identify and interact with the gay community in the same way.

Conflicts of interest

The authors declare no conflict of interest.

Acknowledgement

This research did not receive any specific funding.

References

1 NSW Health. NSW HIV Strategy 2016–2020. Quarter 4 & annual 2017 data report. 2017. Available online at: https://www.health.nsw.gov.au/endinghiv/Publications/q4-2017-and-annual-hiv-data-report.pdf [verified 11 November 2019].
2 Keen P, Gray R, Telfer B, Guy R, Schmidt H-M, Whittaker B, *et al*. The 2016 HIV diagnosis and care cascade in New South Wales, Australia: meeting the UNAIDS 90–90–90 targets. *J Int AIDS Soc* 2018. 21: e25109. doi:10.1002/jia2.25109
3 Kirby Institute. HIV, viral hepatitis and sexually transmissible infections in Australia: annual surveillance report 2017. Sydney: UNSW Sydney, Kirby Institute; 2017.
4 NSW Health. NSW HIV Strategy 2016–2020: quarter 1 2018 data report. 2018. Available online at: https://www.health.nsw.gov.au/endinghiv/Publications/q1-hiv-2018-hiv-data-report.pdf [verified 11 November 2019].
5 Horton P, Rydstrom H, Tonini M. Contesting heteronormativity: the fight for lesbian, gay, bisexual and transgender recognition in India and Vietnam. *Cult Health Sex* 2015; 17: 1059–73. doi:10.1080/13691058.2015.1031181
6 Stardust Z, Gray J, Mackie B, Chen T. Effective HIV prevention and health promotion among Asian gay and homosexually active men in Sydney. Sydney: ACON; 2017.
7 Guadamuz TE, Cheung DH, Wei C, Koe S, Lim SH. Young, online and in the dark: scaling up HIV testing among MSM in ASEAN. *PLoS One* 2015; 10: e0126658. doi:10.1371/journal.pone.0126658
8 Tao J, Li M, Qian H, Wang L, Zhang Z, Ding H, *et al*. Home-based HIV testing for men who have sex with men in China: a novel community-based partnership to complement government programs. *PLoS One* 2014; 9: e102812. doi:10.1371/journal.pone.0102812
9 UNSW Sydney, Centre for Social Research in Health. Gay community periodic surveys. 2018. Available online at: https://csrh.arts.unsw.edu.au/research/publications/gcps/ [verified 24 June 2018].
10 Koblin BA, Husnik MJ, Colfax G, Huang Y, Madison M, Barresi P, *et al*. Risk factors for HIV infection among men who have sex with men. *AIDS* 2006; 20: 731–9. doi:10.1097/01.aids.0000216374.61442.55
11 Guy R, Jamil MS, Fairley C, Smith K, Grulich A, Bradley J, *et al*. P17.07 Sexual risk behaviour predicts more frequent use of HIV self-testing: early findings from the FORTH Trial. *Sex Transm Infect* 2015; 91: A225–26. doi:10.1136/sextrans-2015-052270.585
12 Li R, Wang H, Pan X, Ma Q, Chen L, Zhou X. Prevalence of condomless anal intercourse and recent HIV testing and their associated factors among men who have sex with men in Hangzhou, China: a respondent-driven sampling survey. *PLoS One* 2017; 12: e0167730. doi:10.1371/journal.pone.0167730
13 Stephenson R, White D, Darbes L, Hoff C, Sullivan P. HIV testing behaviors and perceptions of risk of HIV infection among MSM with main partners. *AIDS Behav* 2015; 19: 553–60. doi:10.1007/s10461-014-0862-4
14 Teh MF. Behind the mask: Asian gay men and challenges in HIV health promotion. *HIV Australia* 2011; 9: 20–2.
15 Reeders D. HIV and the social exclusion of culturally and linguistically diverse men who have sex with men. *HIV Australia* 2011; 9: 23–25.
16 van Griensven F, Guadamuz TE, de Lind van Wijngaarden JW, Phanuphak N, Solomon SS, Lo YR. Challenges and emerging opportunities for the HIV prevention, treatment and care cascade in men who have sex with men in Asia Pacific. *Sex Transm Infect* 2017; 93: 356–62. doi:10.1136/sextrans-2016-052669
17 Reeders DW. Double trouble? The health needs of culturally diverse MSM. Melbourne: Centre for Culture, Ethnicity and Health; 2010. Available online at: https://www.ceh.org.au/double-trouble-the-

health-needs-of-culturally-diverse-men-who-have-sex-with-men/ [verified 11 November 2019].

18 Guy R, Wabe N, Watchirs-Smith L, Schmidt H, Amin J, Oglivie E, *et al*. Who is the EPIC–NSW program reaching? A comparison of EPIC–NSW participants and HIV notifications. Presented at the 2017 Australasian HIV and AIDS Conference; 6–8 November 2017; Canberra, ACT, Australia. 2017. Available online at: https://az659834.vo.msecnd.net/eventsairaueprod/production-ashm-public/5a885dc790814a32b9d5aa755bf15993 [verified 20 November 2019].

19 Global Commission on HIV and the Law. Risks, rights & health. New York: United Nations Development Programme HIV/AIDs Group; 2012. Available online at: https://www.undp.org/content/undp/en/home/librarypage/hiv-aids/hiv-and-the-law–risks–rights—health.html [verified 11 November 2019].

20 Australian Government Department of Home Affairs. Meeting our requirements: health. 2018. Available online at: https://www.homeaffairs.gov.au/trav/visa/heal [verified 9 July 2018].

21 Forbes L, Frommer M. Australia, migration and HIV: an evolving policy landscape. *HIV Australia* 2014; 12: 26–27.