

A cross-sectional investigation of the factors associated with awareness of PEP and PrEP among Queensland university students

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Abstract

Objective: University creates unique social environments for many young people that can result in behaviour changes that can impact sexual health-related risks and facilitate transmission of HIV. Little is known about HIV knowledge, risk, and awareness of pre-exposure prophylaxis/post-exposure prophylaxis (PrEP/PEP) among Australian university students.

Methods: A 2019 online survey distributed through Queensland universities, using active recruitment/snowball sampling. Descriptive and logistical regression analysis investigated HIV knowledge/risk and PrEP/PEP awareness.

Results: Of the 4,291 responses, 60.4% were 20–29 years old, 57.0% identified as heterosexual, and 31.8% were born-overseas. Mean HIV knowledge score was 9.8/12. HIV risk scores were higher among men-who-have-sex-with-men (MSM) (mean=5.2/40) compared to all other sexual behaviours (mean=3.1/40). Logistic regression indicated PrEP and PEP awareness was associated with older age ($p<0.05$), being non-binary/gender-diverse ($p<0.05$), and MSM ($p<0.05$). Lower odds of PrEP awareness were associated with international student status ($p<0.05$).

Conclusion: This study highlights the need for future health promotion targeting younger Australians at risk of HIV to increase uptake of PrEP/PEP, particularly among overseas-born young people and those ineligible for appropriate health care in Australia.

Implications for public health: Addressing these gaps will improve sexual health outcomes for young Australians at risk of HIV and work towards virtual elimination of HIV transmission in Australia.

Key words: HIV, PrEP, PEP, university students, men who have sex with men, international students

Background

In Australia, young people aged 20–29 years represented a quarter of new HIV notifications in 2021 (4 per 100,000), the majority (82%) acquired through male-to-male sexual contact.¹ HIV notification rates for overseas-born populations living in Australia are almost five times greater than their Australian-born counterparts (8.3 and 1.7 per 100,000, respectively)¹ making them another key priority population for HIV prevention strategies. Young people aged 20–29 years are the primary cohort attending university,² a social environment that can impact patterns of sexual behaviour (e.g., increased sexual

partnerships and reduced condom usage) and facilitate transmission of HIV.^{3,4} Australian universities also enrol large numbers of international students (approximately 700,000 annually before the COVID-19 pandemic).² These combined factors support the need to investigate HIV knowledge, risk, and prevention awareness among university populations.

Pre-exposure prophylaxis (PrEP) and post-exposure prophylaxis (PEP), the use of antiretrovirals by HIV-negative persons, are highly effective HIV prevention strategies,⁵ accessible at sexual health clinics, general medical practices, and hospital emergency departments.⁵ Australian

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citizens, permanent residents who hold a current Medicare card (Australia's universal healthcare system) and those with reciprocal healthcare agreements can access PrEP at a subsidised cost through the Australian Pharmaceutical Benefits Scheme (PBS).⁵ International students not covered by reciprocal healthcare agreements must have overseas student health cover (OSHC) prior to commencing studies in Australia, which provides access to pharmaceuticals medicines,⁶ including PrEP.⁷ However, this cover is limited, potentially creating financial hardship and access barriers.

A body of research exploring sexual health among university students exists,^{3,4} however, understanding of HIV knowledge, risk, and awareness of PrEP and PEP among this group in Australia is scant. This study aimed to gain understanding of these factors among a cohort of Queensland university students to inform future directions for targeted HIV prevention strategies and Australia's commitment to achieving virtual elimination of HIV transmission.

Methods

Study design and target population

The 2019 *Tertiary Students Sexual and Reproductive Health (TSSRH) Survey: South-East Queensland Pilot* was an on-line anonymous cross-sectional survey of enrolled Queensland university students aged 18-years and over. Based on calculations using the Australian Bureau of Statistics sample size calculator, the study aimed to recruit approximately 1,430 participants.⁸ Students were actively recruited through on-campus advertisements/posters and email invitations at The University of Queensland, Queensland University of Technology, University of Southern Queensland, University of the Sunshine Coast and Griffith University. Snowball sampling through social networks and social media was used to recruit students from other Queensland institutions. Data were collected from July–September 2019 via a 30–40-minute survey, consisting of mostly closed-ended questions with built-in branching logic, using the REDCap electronic data capture tool hosted at The University of Queensland.^{9,10}

Data Analysis

Survey data, including demographic, behavioural, HIV, PrEP, and PEP information were analysed using Stata Statistical Software: Release 17¹¹ to investigate (1) characteristics of risk associated with men who have sex with men (MSM), the predominant group at risk in Australia¹; (2) a 12-item HIV knowledge score; (3) a 14-item HIV risk score; and (4) factors associated with PrEP/PEP awareness.

Descriptive analyses were conducted to describe the participant demographics, reported as percentages and means or medians (for parametric and non-parametric distribution of scores, respectively) and to compare demographic and behavioural characteristics of MSM and male participants who reported having sex with both men and women (MSMW) to the remaining study participants. Nine categories of sexual behaviours of participants (e.g., MSM, MSMW) were determined using three survey items pertaining to self-reported gender (man, woman, non-binary, or different identity), self-reported sexual behaviour (I am heterosexual(straight)/homosexual(gay/lesbian)/bisexual/other/not sure) and sexual attraction (I am attracted only to people of the opposite sex/of my own sex/of the opposite sex and my own sex/not sure). Cross-tabulation with Pearson's chi-squared (χ^2) was performed to determine whether self-reported behaviours (e.g., condom use) and

PrEP/PEP awareness differed between MSM and participants reporting other sexual behaviours.

A HIV knowledge score was calculated by assigning one point for every correct survey response to 12 HIV-related knowledge questions, with an overall score calculated. Univariate logistic regression analyses were conducted to identify associations between HIV knowledge and (1) MSM/MSMW and (2) survey respondents reporting ever having had sex. Participants responses were included in analysis only if all 12 questions were answered.

A HIV risk score was calculated from 14 survey items capturing known HIV risk factors, including behaviours, condom usage, number of sexual partners,^{1,12} and HIV prevalence (low/high) in the reported country of birth (inclusive of all student types: domestic Australian-born, domestic overseas-born and international). High prevalence was defined as 1% or greater among the general population.¹³

Participants scored one or more points, to a maximum of 40 for each risk item they met across the 14 survey items, with some items containing multiple risks, for example condom usage was scored: always = 0, sometimes = 1, never = 2 to account for higher risk behaviours. HIV risk score was stratified by factors of interest in this study: age, student status, Medicare access, and PrEP awareness (scoring and weighting provided in [Supplementary table 1](#)). Participants that reported no previous sexual experience were included in the HIV risk score to be considered for items pertaining to injecting drug use, receiving a score of zero for all items relating to sexual activity (e.g., condom usage). Analysis of variance (ANOVA) was used to assess the means between groups.

Logistical regression analyses were conducted to identify demographic and behavioural factors associated with PrEP/PEP awareness.^{12,14} Two questions pertained to awareness of PrEP and PEP. Of the three available responses to the question: "Have you ever heard of PrEP?", answers: "PrEP is available now" and "PrEP will be available in the future" were combined to form a code of "awareness of PrEP," while "I have never heard of PrEP" was coded as "no awareness of PrEP." This was to give a binary outcome ("aware of PrEP"/"not aware of PrEP"). The same method was applied to PEP awareness. Factors significantly associated with PrEP/PEP awareness at a p -value < 0.2 in univariate logistic regression analysis were included in the multivariate model. Modified Hosmer-Lemeshow was used to test goodness-of-fit of the final model.

Results

Of the 4,291 responses, the majority were 18–29 years (3,751, 87.4%), identified as female (2,921, 68.1%), identified as heterosexual (including men who have sex with women and women who have sex with men) (2,445, 57.0%), and had Medicare access (3,506, 81.7%). Of the 785 (18.3%) with no Medicare access, most (672, 85.6%) had OSHC. Most respondents were Australian-born domestic students (2,925, 68.2%). Of the overseas-born participants, inclusive of international students and overseas-born domestic students, most were from the eastern (324, 24.6%) and south-eastern (222, 17.5%) regions of Asia.

Sexual experience (including any or all of vaginal, anal or oral intercourse) was reported by the majority of participants (3,075, 71.7%), while 17.5% (752) reported no previous sexual experience. In the previous 12 months, 24.7% (1,058) of the total sample reported sex with one or more casual partner and 26.4% (1,133) reported

having a HIV test. Compared to participants reporting all other sexual behaviours, a greater proportion of MSM reported having five or more casual partners in the previous 12 months (189, 4.6% vs. 55, 28.0%, $\chi^2 p < 0.001$), and previous HIV testing (108, 52.2% vs. 1,025, 25.1%, $\chi^2 p < 0.001$) (Supplementary table 2).

HIV knowledge score

Of the cohort 3,862 participants (90.0%) responded to all 12 HIV knowledge items (Table 1). The two items with the lowest correct response rates were the item pertaining to PrEP, “You can take a pill every day to prevent getting infected with HIV” (20.5%) and “You can get HIV from mosquitoes” (42.6%). Overall individual participant scores ranged from zero (no correct responses) to 12 (all statements answered correctly) (mean = 9.8). Twenty-two respondents (0.6%) scored zero. Compared to other respondents, MSM/MSMW were likely to have higher knowledge scores (OR 1.51 $p < 0.05$) with mean HIV knowledge scores of 10.5 for MSM/MSMW compared to 9.7 among the remainder of respondents. Similarly, sexual experience was associated with higher knowledge scores (OR 1.24 $p < 0.05$) with average scores of 10.0 for participants who indicated previously having sex (including vaginal, anal or oral intercourse) compared to 9.2 for participants reporting never having had sex.

HIV risk score

Participants HIV risk scores ranged from 0 to 36 out of 40 (mean = 3.2), with 71.7% (3,078) meeting one or more HIV risk criteria (higher scores indicating higher HIV risk). Mean HIV risk scores were higher among MSM/MSMW (5.2, $p < 0.001$) compared to those reporting other sexual behaviours (3.1). Mean risk scores for MSM/MSMW increased by age with 35–39-year-olds having the highest score (10.5, $p < 0.001$). Mean risk scores for MSM/MSMW also increased according to student enrolment type – international students (6.0, $p < 0.001$) and

overseas-born domestic students (5.2) had higher risk scores than Australian-born domestic students (4.9) – and by Medicare access (6.7, $p < 0.001$) and awareness of PrEP (6.0, $p < 0.001$) (Table 2).

PrEP/PEP awareness and use

Of the cohort, only 21.0% (902) self-reported PrEP awareness, which was similar to the proportion that correctly answered HIV knowledge statement “You can take a pill every day to prevent getting infected with HIV” (20.5%, 790), while 17.4% (747) of the total cohort reported awareness of PEP. Less than 0.5% (40; 23 PrEP, 17 PEP) reported having used either strategy. MSM/MSMW indicated higher PrEP awareness (110, 53.1%) compared to participants reporting all other sexual behaviours (792, 19.4%, $\chi^2 p < 0.001$), and higher self-reported use (19, 9.2% versus 4, 0.1%, respectively, $\chi^2 p < 0.001$). Similarly PEP awareness was higher among MSM/MSMW (96, 46.4%) compared to participants reporting other sexual behaviours (651, 15.9%, $\chi^2 p < 0.001$), as was PEP use (10, 4.8% and 6, 0.2% respectively, $\chi^2 p < 0.001$). PrEP awareness among the MSM/MSMW students varied by enrolment type with 61.3%¹⁹ of the 31 domestic overseas-born and 60.0%²¹ of the 35 international MSM students self-reporting PrEP awareness compared to 49.7% (70) of the 141 domestic Australian-born MSM/MSMW students ($\chi^2 p < 0.001$). Among MSM/MSMW students PrEP awareness also varied by age, with 45.3%²⁴ of 18–19 year-olds, 55.1% (54) 20–24 year-olds, and 62.2%²³ 25–29 year-olds self-reporting PrEP awareness ($\chi^2 p < 0.001$) (Supplementary table 3).

Sexual experience (reporting ever having had sex, including vaginal, anal or oral intercourse) was associated with higher PrEP awareness with 24.9% (765/3,075) of participants reporting awareness of PrEP compared to 18.2% (137/752) reporting no sexual experience (OR 1.74 $p < 0.05$). Similarly, PEP awareness was also associated with sexual experience with 20.5% (629/30,075) of those reporting sexual experience being aware of PEP compared to 15.7% (118/752)

Table 1: HIV knowledge statements and mean HIV knowledge score (n=3,862).

HIV Statement (correct answer)	Correctly answered	
	n	%
You can get HIV by sharing needles and syringes when injecting drugs (True)	3,740	96.9
A woman can get HIV through having sex with a man (True)	3,695	95.7
A man can get HIV through having sex with a man (True)	3,663	94.9
Someone who looks healthy cannot pass on HIV infection (False)	3,659	94.8
You can get HIV by hugging someone who is infected with HIV (False)	3,648	94.5
Contraceptive pill (birth control) protects women from HIV infection (False)	3,604	93.3
A man can get HIV through having sex with a woman (True)	3,549	92.0
Condoms used during sex helps to protect you from getting HIV (True)	3,440	89.1
If a woman with HIV is pregnant, she can pass it to her baby (True)	3,205	83.0
You can get HIV (the AIDS virus) when someone with HIV coughs or sneezes near you (False)	3,191	82.7
You can get HIV from mosquitoes (False)	1,683	43.6
You can take a pill every day to prevent getting infected with HIV (True)	790	20.5
Mean HIV knowledge score (Range 0-12)		
Total sample		9.8
MSM/MSMW ^a		10.5
All other sexual behaviours ^b		9.7

^aMSM/MSMW = male participants who reported having sex with other men (MSM) combined with male participants who reported having sex with both men and women (MSMW).

^bAll other sexual identities includes men and women who have sex with the opposite gender only, women who have sex with women, women who have sex with men and women, and men and women who are unsure.

Table 2: HIV risk scores for MSM compared to all other sexual identities.

	MSM/MSMW ^a (n=207)	All other sexual behaviours ^b (n=4,084)	p-value ^c
Mean HIV risk score Range 0–36 (total cohort mean = 3.2)	5.2	3.1	<0.001
Mean HIV risk score by age group			
18–19 years	2.2	2.4	<0.001
20–24 years	5.8	3.2	
25–29 years	7.0	3.5	
30–34 years	5.0	3.8	
35–39 years	10.5	4.1	
40 years and over	6.8	3.5	
Mean HIV risk score by student status			
Domestic Australian born	4.9	3.3	<0.001
Domestic Overseas born	5.2	3.0	
International	6.0	2.3	
Mean HIV risk score by Medicare status			
No Medicare access	6.7	2.3	<0.001
Medicare access	5.0	3.3	
Mean HIV risk score by PrEP awareness			
Not aware of PrEP	2.9	3.3	<0.001
Aware of PrEP	6.0	4.1	

^aMSM/MSMW = male participants who reported having sex with other men (MSM) combined with male participants who reported having sex with both men and women (MSMW).

^bAll other sexual identities includes men and women who have sex with the opposite gender only, women who have sex with women, women who have sex with men and women, and men and women who are unsure.

^cAnalysis of variance (ANOVA) was used to assess the means between groups.

reporting no sexual experience (OR 1.60 $p<0.05$). In the multivariate logistic regression, higher PrEP awareness were significantly associated with older age compared to 18–19-year-olds (20–24 years adjusted odds ratio (aOR) 2.68, 25–29 years aOR 2.65, 30–35 years aOR 2.86, 35–39 years aOR 1.98, $p<0.05$). This was similar for PEP awareness, with older age associated with increased odds of awareness compared to 18–19-year-old participants (20–24 years aOR 2.12, 25–29 years aOR 2.24, 30–35 years aOR 2.33, 35–39 years aOR 1.97, $p<0.05$).

Compared to men, being non-binary/gender-diverse was significantly associated with increased odds of PrEP and PEP awareness (aOR PrEP 8.54, $p<0.05$; aOR PEP 3.91, $p<0.05$). Identifying as a woman showed significantly increased odds of PrEP awareness (aOR 1.48, $p<0.05$) and identifying as a different gender identity (i.e. self-reporting a gender identity that differs from those provided in the survey - “man,” “woman,” and “non-binary/gender diverse”) showed a significant association with PEP awareness (aOR 11.81 $p<0.05$). Identifying as MSM (aOR PrEP 73.25, $p<0.05$; aOR PEP 24.35, $p<0.05$), a MSMW (aOR PrEP 11.11, $p<0.05$; aOR PEP 6.90, $p<0.05$) or a woman who has sex with women (aOR PrEP 3.89, $p<0.05$; aOR PEP 3.20, $p<0.05$), were significantly associated with PrEP and PEP awareness compared to men who reported heterosexual behaviours. Having ever had a HIV test was significantly associated with increased awareness of both PrEP and PEP (aOR PrEP 2.28 $p<0.05$; aOR PEP 2.59 $p<0.05$). Compared to domestic Australian-born students, being an international student was significantly associated with lower odds of PrEP and PEP awareness; however, only PrEP was significant in the final model (aOR 0.64, $p<0.05$).

Being a domestic overseas-born student, number of casual partners and prevalence of HIV in country of birth were not significantly associated with PrEP or PEP awareness in the final model (Table 3).

Discussion

This study investigated HIV knowledge, HIV risk and PrEP/PEP awareness among a cohort of Queensland University students. HIV knowledge was high (82%), consistent with the 6th National Survey of Australian Secondary Students and Sexual Health 2018 (80%).¹⁵ Our study extended previous research through inclusion of an additional PrEP/PEP survey item. Few participants were able to correctly answer this item, indicating high levels of HIV knowledge among young Australian university students does not necessarily encompass awareness of biomedical HIV prevention.

Identifying as a man who has sex with men (both MSM and MSMW) was significantly associated with awareness of PrEP/PEP. This finding is not unexpected, as MSM have been a priority population for HIV prevention activities and promotion in Australia from the start of the HIV epidemic.^{1,16} In our sample, MSM/MSMW as a group showed similar levels of awareness of PrEP and PEP as previously reported in Australian MSM.¹⁴ However, when stratified by age group, awareness among our MSM/MSMW participants increased with age. Considering our sample consists of educated young people, a factor linked to higher PrEP awareness,^{14,17} there appears to remain a disparity in awareness linked to age. Emphasising age as an important factor in awareness and highlighting a critical gap in biomedical HIV prevention knowledge among younger populations. This is an important finding given the current HIV notification rates among young people aged 20–29 years.¹ PrEP awareness was also associated with sexual experience, highlighting the need for structured studies to examine PrEP awareness within young people outside of university settings. Consistent with research in other high-income countries,¹⁸ women in general who reported having sex with men had lower PrEP awareness, suggesting the need to consider gender along with age.

In our study, the average HIV risk score among MSM/MSMW was higher for both domestic overseas-born and international MSM/MSMW compared to their Australian-born counterparts. This finding is supported by research conducted in Australia reporting HIV risk behaviours of overseas-born populations are equivalent or higher than their Australian-born counterparts.^{19,20} The theory that a syndemic relationship exists between migration and HIV risk has been explored with studies finding higher HIV-risk behaviours and incident HIV infection present among overseas-born MSM compared with their domestic-born counterparts.^{19,20} In Australia, higher HIV incidence rates are reported among overseas-born MSM, despite higher reported rates of consistent condom usage and lower numbers of sexual partners.^{19,20} This could be linked to lower rates of PrEP use among this population, which can result from limitations in access due to stigma, Medicare, healthcare costs and visa concerns.¹⁹ Our study found that higher proportions of international and overseas-born MSM have self-reported awareness of PrEP compared to Australian-born; however, low numbers of self-reported MSM participants make it difficult to draw conclusions about causal associations. This indicates a need to further investigate PrEP awareness among these groups of university students and examine the determinants that can impact HIV transmission and access to PrEP among international and overseas born student cohorts.^{19,20} Our

Table 3: Adjusted odds ratios (aOR) for PrEP and PEP awareness.

	PrEP Awareness		PEP Awareness	
	aOR	p-value	aOR	p-value
Age group (median age 21; IQR=19-25)				
18–19 years	Ref ^a		Ref	
20–24 years	2.68	<0.001	2.12	<0.001
25–29 years	2.65	<0.001	2.24	<0.001
30–34 years	2.86	<0.001	2.33	<0.001
35–39 years	1.98	0.02	1.97	0.02
40 years and over	1.17	0.63	1.08	0.82
Gender identity				
Man	Ref		Ref	
Woman	1.48	0.05	1.44	0.08
Non-binary, gender diverse	8.54	<0.001	3.91	<0.001
Different identity ^b	1.00	(empty)	11.81	0.03
Student enrolment status				
Domestic (Australian born)	Ref		Ref	
Domestic (Overseas born)	0.84	0.25	0.83	0.26
International	0.64	0.01	0.93	0.69
HIV prevalence in country of birth				
HIV prevalence <1%	Ref		Ref	
HIV prevalence ≥1%	1.32	0.47	1.49	0.30
Sexual behaviours				
Men who have sex with women	Ref		Ref	
Men who have sex with men	73.25	<0.001	24.35	<0.001
Men who have sex with men and women	11.11	<0.001	6.90	<0.001
Men unsure	3.46	<0.001	1.80	0.12
Women who have sex with men	0.62	<0.001	0.59	<0.001
Women who have sex with women	3.89	<0.001	3.20	<0.001
Women who have sex with men and women	1.13	0.49	0.94	0.74
Women unsure	1.00	(omitted)	1.00	(omitted)
Unsure	1.00	(omitted)	1.00	(omitted)
Number of casual sex partners in previous 12 months				
0	Ref		Ref	
1	0.79	0.13	0.79	0.15
2	1.06	0.76	1.15	0.50
3	1.16	0.53	0.83	0.47
4	1.12	0.73	0.93	0.82
5-10	1.00	0.99	0.76	0.25
More than 10	1.56	0.14	1.59	0.11
Condom usage				
Never	Ref		Ref	
Rarely	1.27	0.22	1.62	0.02
Sometimes	1.81	<0.001	1.54	0.03
Most of the time	2.02	<0.001	1.92	<0.001

(continued)

TABLE 3. Continued

	PrEP Awareness		PEP Awareness	
	aOR	p-value	aOR	p-value
Always	1.72	<0.001	1.93	<0.001
Not applicable	2.37	0.02	N/A	1.91
Ever had HIV test				
No	Ref		Ref	
Yes	2.28	<0.001	2.59	<0.001
Unsure	0.92	0.63	1.02	0.93

^aRef = reference group. Statistically significant adjusted odds ratio (aOR) **bolded**.

^bDifferent identity – includes participants who self-reported that their gender identity is different from man, woman and non-binary/gender diverse options.

findings highlight that this is especially important for international and domestic overseas-born MSM/MSMW without access to Medicare or adequate insurance.

Access to PrEP for international students can be impacted by OSHC limits on prescription medications resulting in financial barriers for international students.^{7,19} Additionally, ineligibility for government-subsidised PrEP, can result in costs exceeding AUD\$200 per 30-day supply (compared to approximately AUD\$40 under PBS-subsidy) or overseas importation of generic versions.^{21,22} The cost-related factors can and do impede access to PrEP. They require consideration from both the policy and insurance perspective for not only access to PrEP, but for the availability and promotion of other HIV prevention strategies (such as condoms) that may be the preferred option for both HIV and other sexually transmissible infections (STI) prevention for some populations.⁴

Australia accepts approximately 700,00 international students annually (predominantly from south-east Asia),² and equitable access to HIV prevention for these students is imperative. Despite downward trends in notifications in Australia, the highest HIV notification rate in 2021 was among persons born in southeast Asia (8.3 per 100,000, compared to 1.7 per 100,000 among Australian-born persons). Additionally, the proportions of HIV notifications among overseas-born MSM accounted for 48% of new notifications among MSM in 2021.¹ Issues of access extend to young people of refugee background, who despite generally being Medicare eligible²³ and some (particularly from high-prevalence regions) having high HIV knowledge, can have lower sexual health literacy, increased sexual health risks and encounter barriers to utilisation of sexual and reproductive health services in Australia.¹² Indicating a need for targeted, equitable and culturally sensitive access to sexual, reproductive and HIV health information and services for populations at risk of HIV in Australia.

Our results also highlight the importance of considering domestic students as two groups –Australian-born and overseas-born. As a demographic often overlooked in research,^{3,4} domestic overseas-born students made up 15.2% (653) of respondents and indicated higher risk scores than their Australian-born counterparts (particularly among MSM/MSMW). There is a need to consider the range of intersecting factors (such as gender, sexuality, ethnicity) this group may experience and the cumulative impact these can have on sexual risks, knowledge and healthcare seeking behaviours.^{12,24} This can be

further impacted by the influence of religious/spiritual and cultural beliefs, health literacy and acculturation.^{12,24}

Improving healthcare provider training, in culturally responsive care, could improve access and linkage to care for international students and all domestic students who come from culturally and linguistically diverse backgrounds.^{4,24} Tailored health promotional material targeted towards young MSM, which includes culturally diverse messaging, freely distributed through university networks is important to enhance awareness and uptake.^{4,24} University-based peer support services could bridge the link between clinical and social systems, particularly for young and international university students.²⁴ Additionally, mobile HIV/STI testing services, on campus point-of-care testing and HIV self-testing provide broader accessibility to populations who may not attend conventional testing sites (e.g., general practices and health clinics).²⁵ These models of testing have been found to be effective in reaching priority populations, including those identified in this study, who have never tested for HIV or may test infrequently.²⁵

Strengths and limitations

This data offered a unique insight into the differences in HIV knowledge and risk among international, domestic Australian-born and domestic overseas-born students, a demographic distribution not commonly captured. However, impact of acculturation of domestic overseas-born students could not be determined as data on time spent living in Australia was not collected. These data offered a large sample size (4,291 respondents) with over 90% of the cohort under the age of 29, providing useful insight into the awareness of biomedical prevention among a sample of young people in Australia. However due to large numbers of non-responses from participants relating to HIV prevention (including PrEP and PEP) there may be limitations in interpretations that have been made.

Estimates from Queensland universities show the sample is representative of international students at the time of participant recruitment (ranging from 8 to 32% across institutions); however, the sample over represents female perspectives, making up 68% of our sample compared to 54–65% across Queensland institutions.^{26,27} Data collection occurred prior to the impacts of COVID-19 lockdowns, allowing for international student responses to be reflected in our findings. Data collection occurred during 2019 when PrEP was still in its infancy in Australia, potentially limiting awareness. MSM accounted for less than 5% of the study population, limiting analyses, which should be considered when interpreting the results. The study collected self-reported data, which can present limitations in accuracy, such as recall and social desirability responding, resulting in over- or under-reporting of data. However, self-reporting is widely used in health and epidemiological research, enabling a wider array of responses to be captured that may not be easily obtained through other methods and can provide a sufficient understanding of sexual health and HIV risk behaviours.²⁸

Conclusion

This study highlights that while subsets of Queensland university students are aware of PrEP and PEP, there remains a disparity in awareness linked to age. Results of this study highlight the need for

future health promotion opportunities targeting younger Australians to increase uptake of PrEP and PEP and reduce the impact of age-related HIV risk behaviours, and the resulting health and economic burdens of life-long HIV infection. Increased risk among international and overseas-born domestic MSM students highlights the importance of HIV prevention for culturally diverse and Medicare ineligible students. Addressing these identified gaps in understanding will improve the sexual health outcomes for young Australians at risk of HIV and work towards Australia's goal of virtual elimination of HIV transmission.

Ethics

The *TSSRH Survey* was conducted under ethical clearance from The University of Queensland Human Research Ethics Committee (Project Number: 2018/HE002579).

Conflicts of interest

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests: Judith A. Dean reports financial support, administrative support, and equipment, drugs, or supplies were provided by Queensland Professorial Chair in HIV & STIs. Armin Ariana reports financial support and administrative support were provided by Griffith University. Jo Durham reports financial support and administrative support were provided by QUT School of Public Health.

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Data availability statement

The data that support this study cannot be publicly shared due to ethical reasons and may be shared on reasonable request to the corresponding author, if appropriate.

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Appendix A Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.anzjph.2024.100136>.