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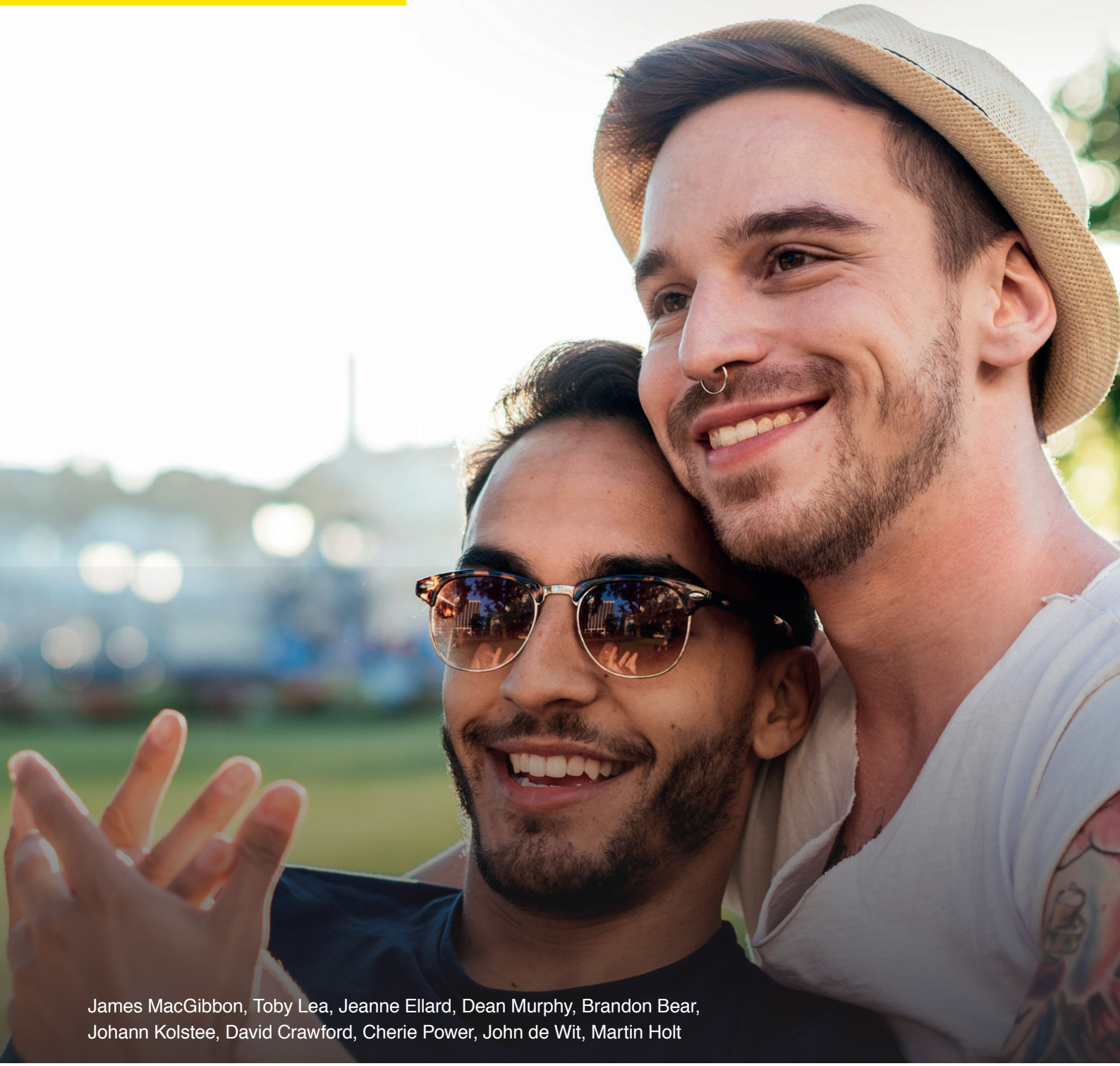
Attitudes to biomedical HIV prevention among Australian gay and bisexual men: Key findings from the PrEPARE Project 2019



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BBV & STI RESEARCH, INTERVENTION AND STRATEGIC EVALUATION

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We thank all the participants who completed questionnaires and the current and former members of the project reference group.

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Acronyms

ACT	Australian Capital Territory
CAIC	condomless anal intercourse with casual male partners
CAIR	condomless anal intercourse with regular male partners
GBM	gay and bisexual men
HIV	human immunodeficiency syndrome
IQR	interquartile range
M	mean
Mdn	median
NSW	New South Wales
NT	Northern Territory
PEP	post-exposure prophylaxis
PrEP	pre-exposure prophylaxis
Qld	Queensland
SA	South Australia
SD	standard deviation
STI	sexually transmissible infection
Tas.	Tasmania
TasP	treatment as prevention
Vic.	Victoria
WA	Western Australia

Key findings from the 2019 survey

- The proportion of all survey participants who reported they had ever used PrEP increased to 43% in 2019 from 24% in the 2017 survey.
- Nearly all participants (98%) had heard of PrEP and three-quarters of participants (75%) knew someone who had taken PrEP, a significant increase from the 2017 survey (66%).
- Most current PrEP users were accessing it via their doctor (84%) and most (65%) reported increased sexual confidence and reduced concern about acquiring HIV as a result of PrEP.
- Among HIV-negative and untested/unknown men (including current PrEP users), the most preferred ways to take PrEP were long-acting injections (40%), daily pills (22%), event-based dosing (19%), and implants (18%). Current PrEP users were more likely to prefer long-acting injections than non-users (51% vs. 33%), and less likely to prefer event-based dosing than non-users (8% vs. 27%).
- Some participants (15% of all men who had ever used PrEP) reported stopping PrEP. Most had stopped PrEP temporarily. Common reasons for stopping PrEP were having less sex, being in a monogamous relationship or concerns about taking medication.
- Among HIV-negative and untested/unknown men who had never used PrEP, willingness to use PrEP was lower in 2019 than in 2017 (36% in 2017 vs. 32% in 2019), and concern about using PrEP was higher in the same group (36% in 2017 vs. 46% in 2019). The change in willingness to use PrEP was not statistically significant.
- Overall, willingness to have sex with someone using PrEP increased slightly from 47% in 2017 to 54% in 2019. HIV-positive participants were more likely than HIV-negative and untested/unknown status participants to be willing to have sex with someone using PrEP (82% vs. 50%).
- Among men who had never used PrEP, support for gay and bisexual men using PrEP decreased from 75% in 2017 to 54% in 2019.
- Belief that HIV treatment prevents transmission increased to 35% in 2019; this increase was primarily among HIV-negative and untested men. Belief that HIV treatment prevents transmission remained higher among HIV-positive participants compared to HIV-negative and untested/unknown status participants (65% vs. 33% in 2019).
- Overall, agreement that early HIV treatment is necessary increased to 81% in 2019.

Introduction

The PrEPARE Project is a repeated, cross-sectional study of Australian gay and bisexual men's (GBM) attitudes to biomedical HIV prevention, particularly pre-exposure prophylaxis (PrEP) and HIV treatment as prevention (TasP). The study was first conducted in 2011, and has been repeated every two years(Lea et al., 2018). The main method of data collection is a national online survey of Australian GBM, primarily advertised through Facebook. The study website can be seen at https://prepareproject.org.au/.

This report focuses on the 2019 survey results, but also includes analyses of change over time in key measures, such as willingness to use PrEP and belief that HIV treatment prevents transmission.

Method

Recruitment and procedures

For the 2019 survey round, data were collected between April and May using Qualtrics online survey software. Data collection occurred at a similar time of year in 2011, 2013, 2015 and 2017. As in previous rounds, the 2019 survey was promoted on Facebook using paid advertisements targeting GBM across Australia and the Facebook pages, Twitter feeds and other social media platforms of community-based HIV and lesbian, gay, bisexual, transgender and intersex organisations. In addition, 860 participants from the 2017 PrEPARE survey who consented to being contacted about future research were invited to participate via email, of whom 279 (22.9%) completed the 2019 survey.

Potential participants were directed to the survey website (https://prepareproject.org.au/), which explained the objectives of the study and provided access to the online questionnaire. Participants were eligible to participate in the survey if they:

- were aged at least 18 years old
- identified as male or gender non-binary
- did not identify as heterosexual, and
- lived in Australia.

In 2017 and 2019, a statement was included on the study website encouraging the participation of trans men who have sex with men, which was not explicitly stated in previous survey rounds. There was no remuneration or other incentive offered to participants. The study design and procedures were approved by the Human Research Ethics Committee of UNSW Sydney and the Research Ethics Review Committee of ACON.

Measures

Gender identity and intersex status

The following questions were asked of participants to determine their gender identity and intersex status:

- What is your current gender? (male; female; non-binary; different identity).
- What gender were you assigned at birth? (male; female).
- Are you intersex? (yes; no; prefer not to say).

The 2019 survey included people who identified as male, non-binary or a different identity, but excluded people who identified as female from participation. Participants who reported their current gender as male, their gender assigned at birth as female, and did not identify as intersex, were categorised as trans men.

Attitudes towards PrEP, HIV treatments and condoms

Reliable scales that were used in previous survey rounds were included in the 2019 survey. All scale items were asked on a 5-point Likert scale ranging from ‘strongly disagree’ (1) to ‘strongly agree’ (5). Scales scores were calculated from the mean of the items in each scale (ranging from 1 to 5) with a score of ≥ 4 indicating

positive agreement with the scale. For example, participants who scored ≥ 4 on the *Willingness to use PrEP* scale were categorised as willing to use PrEP. For more information on the development of these scales, including scale items and reliability analyses, please see our peer reviewed publications and the previous project report (Holt, Lea, Kippax, et al., 2016; Holt, Lea, Schmidt, et al., 2017; Holt, Lea, Schmidt, et al., 2016; Holt et al., 2012; Lea et al., 2018).

The following scales were administered to all HIV-negative and untested/unknown status participants who had never taken PrEP (n=631):

- *Willingness to use PrEP* (7 items); introduced in 2011
- *Concern about using PrEP* (2 items); introduced in 2011
- *Likelihood of decreased condom use if using PrEP* (2 items); introduced in 2011
- *Reduced HIV concern from PrEP* (3 items); introduced in 2017.

The following scales (introduced in 2015) were administered to all HIV-negative men who had never taken PrEP and all HIV-positive men (n=702):

- *Support for gay and bisexual men taking PrEP* (7 items)
- *Willingness to have sex with men taking PrEP* (3 items).

The following scales (introduced in 2017) were administered to all participants who were taking PrEP at the time of survey (n=441):

- *Sexual confidence and reduced HIV concern from PrEP* (4 items)
- *Concerns about PrEP disclosure* (3 items).

The following scales were administered to all participants (n=1,220):

- *HIV treatment prevents transmission* (3 items); introduced in 2013
- *Early HIV treatment is necessary* (3 items); introduced in 2013
- *Personal experience in using condoms* (9 items); introduced in 2011
- *Confidence in discussing condoms with partners* (2 items); introduced in 2011.

Effectiveness and acceptability of HIV prevention strategies

Since 2013, survey participants have been asked about how effective and how acceptable they considered different HIV prevention strategies to be, including condoms, serosorting (matching HIV status before sex without condoms), PrEP, and early HIV treatment. In 2017, items about the effectiveness and acceptability of "early antiretroviral treatment of people with HIV" were replaced with items about "sustained HIV treatment and undetectable viral load".

For each prevention strategy, participants rated how effective they considered it to be on a 5-point scale (1=not at all effective; 5=completely effective), and how acceptable the strategy was to them (1=not at all acceptable; 5=completely acceptable).

Alcohol and other drug use

Since 2015, participants have been asked questions about their use of alcohol and other drugs in the six months before the survey. Participants were asked how often they had consumed more than four alcoholic drinks on one occasion, how often they had used drugs other than alcohol from a list of substances, and how often they had used 'party drugs for the purpose of sex' (sometimes referred to as 'chemsex'). Participants self-determined the meanings of 'party drugs' and 'the purpose of sex'. Finally, participants were asked how often they had injected drugs in the last six months.

Results

Sample characteristics

In 2019, 1,478 participants who met the eligibility criteria and provided informed consent began the survey. Of these, 1,202 men completed all survey items (81.3% completion rate). We retained data from a further 18 men who completed more than 85% of survey items, resulting in a sample of N=1,220. More than one third of the 2019 sample resided in NSW (36.1%), one quarter in Victoria (26.2%) and one fifth in Queensland (18.1%; see Table 1). More than two thirds of participants (72.0%) lived in the capital city of their state or territory.

Table 1. Residential location of participants (n=1,220)

	n	%
State or territory		
Australian Capital Territory	38	3.1
New South Wales	440	36.1
Northern Territory	6	0.5
Queensland	221	18.1
South Australia	66	5.4
Tasmania	27	2.2
Victoria	320	26.2
Western Australia	102	8.3
Residential location		
Capital city	878	72.0
Other city	141	11.6
Regional centre/town	162	13.3
Rural or remote area	39	3.2

The median age of the sample was 35.5 years (interquartile range=28-46). Most participants indicated that they were cisgender men (98.2%), with a small number of participants identifying as transgender men (1.2%, n=15), non-binary (0.3%, n=4), or a different identity (0.3%, n=3). Two participants who identified as non-binary and a 'different identity' reported that they were assigned female at birth. As over 98% of the sample identified as male, we sometimes refer to participants as a whole as 'men' or 'male'. Eighteen participants (1.5%) reported being intersex.

The majority of participants identified as gay (90.6%), were born in Australia (73.6%), had completed tertiary education (58.6%), and were employed full-time (65.2%; see Table 2). These characteristics are very similar to those seen in other samples of Australian gay and bisexual men (Holt, Lea, Mao, et al., 2017; Zablotska et al., 2014). On average, participants from NSW were older than men from other jurisdictions (Mdn=37 vs. 34 years old, p=.02; see Appendix B Table A1).

The majority of participants reported hearing about the survey via Facebook (70.2%), or by an email invitation to participants from the 2017 survey (17.4%), with the remainder hearing about the survey via Instagram (4.5%), an advertisement or article on an organisation's website, app or social media (5%), or via a friend (3%).

Table 2. Demographic characteristics of participants (n=1,220)

	n	%
Age (Median, IQR)	35.5	28–46
Sexual identity		
Gay	1,105	90.6
Bisexual	101	8.3
Other	14	1.1
Country of birth		
Australia	898	73.6
Overseas	322	26.4
Aboriginal and/or Torres Strait Islander		
Yes	38	3.1
No	1,182	96.9
Highest level of education		
Up to year 12	287	23.5
Trade certificate	218	17.9
Undergraduate degree	383	31.4
Postgraduate degree	332	27.2
Employment status		
Full-time	795	65.2
Part-time	131	10.7
Student	158	13.0
Unemployed/retired/other	136	11.2
Medicare coverage		
Yes	1,144	93.8
No	76	6.2

IQR; interquartile range. Table proportions may not sum to 100% due to rounding.

HIV testing, status and treatment

Most men reported that they had been tested at least once for HIV (91.5%). According to self-report, 84.4% (n=1,030) of participants were HIV-negative, 5.9% (n=72) were HIV-positive, and 9.7% (n=96) were untested or of unknown HIV status. Among non-HIV-positive participants, 82.4% reported that their last test for HIV was in the 12 months prior to the survey. Participants in NSW were the most likely to report having ever been tested for HIV ($p<.05$), while men in less populous states and territories (ACT, NT, SA, Tas., WA) were less likely to report having ever been tested for HIV ($p<.05$; see Appendix B Table A2). Among HIV-positive participants (n=71), 98.6% were currently receiving antiretroviral treatments for HIV and 94.4% reported having an undetectable viral load (see Appendix B Table A3).

STI testing and diagnoses

Most men (88.9%) reported having ever been tested for a sexually transmissible infection (STI) other than HIV, and most reported having an STI test in the previous 12 months (72.5%). More than one-quarter (28.9%) reported having been diagnosed with an STI in the previous 12 months.

Men from NSW, Vic. and Qld were more likely to have ever been tested for STIs ($p<.05$) or diagnosed with an STI ($p<.05$) than participants from other states and territories. There was no difference by state or territory in the proportions of men reporting an STI test in the previous 12 months ($p=.11$; see Appendix B Table A4).

Sex with men in the previous six months

Most men (69.5%) in the 2019 survey reported having a current regular male partner (see Table 3). In the 2019 survey, we distinguished between two non-exclusive categories of regular partners: having a boyfriend, partner, or husband and/or having a fuck buddy (or fuck buddies). There were 393 men (32.2%) who reported having a boyfriend, partner or husband, 315 men (25.8%) men who reported having a fuck buddy (or fuck buddies), and 140 men (11.5%) who reported having both types of regular male partner. Among participants with a boyfriend, partner or husband (n=533), 82.6% of HIV-negative men and 40.6% of HIV-positive men were in a seroconcordant relationship (that is with a partner of the same HIV status). Among the same men, two fifths (39.6%) reported that their primary relationship was monogamous, and three fifths (60.4%) reported that their relationship was open or non-exclusive. Most participants with primary partners (69.2%) indicated they had been in their relationship for at least two years.

Among all men, more than half (58.4%) reported any condomless anal intercourse with regular partners (CAIR) in the six months prior to the 2019 survey (see Table 3). Among all men, almost half (48.9%) reported any condomless anal intercourse with casual partners (CAIC) in the six months prior to the 2019 survey. CAIC has become more common in the sample since 2011 ($p<.001$; see Figure 1), as has been observed in Australian and international research (Hess, Crepaz, Rose, Purcell, & Paz-Bailey, 2017; Holt et al., 2018; Holt, Lea, Mao, et al., 2017).

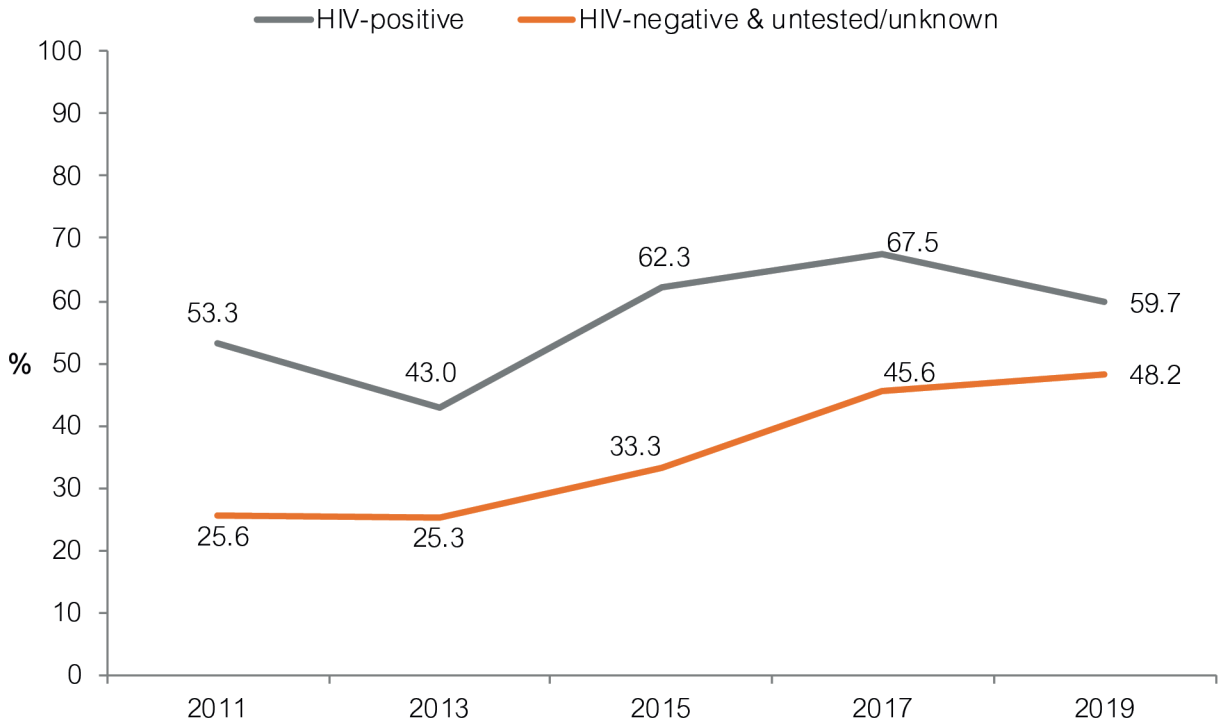
Participants in NSW were more likely than participants in other states and territories to report CAIC in the previous six months, while participants in Qld were less likely to report CAIC ($p<.05$). Participants in Qld were also more likely to report having no casual partner or no anal sex with casual partners ($p<.05$; see Appendix B Table A5).

Table 3. Current relationships and sex with regular and casual male partners in the six months prior to the survey

	HIV-negative & untested/ unknown (n=1,148)		HIV-positive (n=72)	
	n	%	n	%
Relationships with regular partner				
No regular partner	344	30.0	28	38.9
Boyfriend, partner or husband only	369	32.1	24	33.3
Boyfriend and fuck buddya	132	11.5	8	11.1
Fuck buddya only	303	26.4	12	16.7
Relationship type				
No regular partner or fuck buddya only	647	56.4	40	55.6
Monogamous relationship	201	17.5	10	13.9
Non-monogamous relationship	300	26.1	22	28.9
HIV status of boyfriend/partner/husband				
No regular partner or fuck buddy[a] only	647	56.4	40	55.6
HIV-negative	414	36.1	19	26.4
Untested/unknown status	41	3.6	-	
HIV-positive	46	4.0	13	18.1
Anal intercourse with regular partners				
No partner / no intercourse	352	30.7	29	40.3
Consistent condom use	124	10.8	2	2.8
Any anal intercourse without condoms	672	58.0	41	56.9
Anal intercourse with casual partners				
No partner / no intercourse	394	34.3	27	37.5
Consistent condom use	201	17.5	2	2.8
Any anal intercourse without condoms	553	48.2	43	59.7

a Or multiple fuck buddies

Figure 1. Condomless anal intercourse with casual male partners among HIV-positive and HIV-negative & untested/unknown status participants



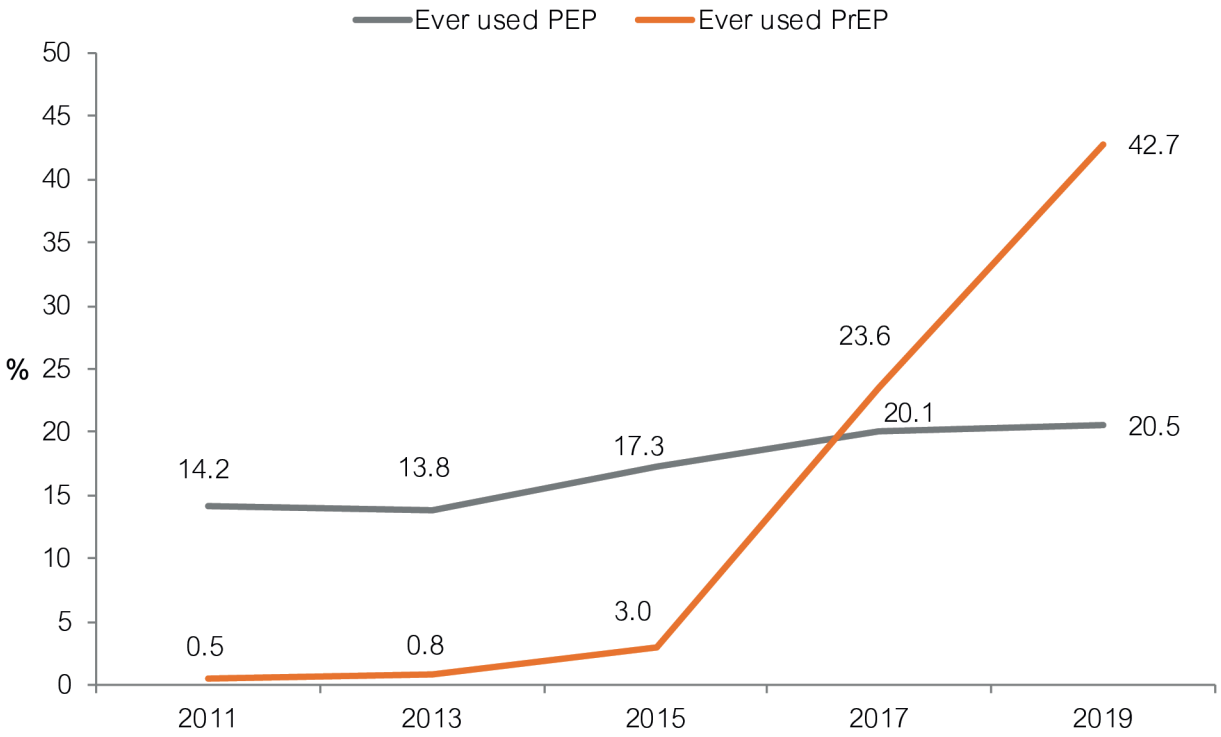
Use of PEP

One fifth (20.5%) of participants (n=250) reported having ever taken post-exposure prophylaxis (PEP) after a suspected exposure to HIV (no significant change from 2015 or 2017, see Figure 2). Among these 250 men, most had received PEP once (67.2%) while the remainder had been on PEP two or more times (32.8%). Men from less populous states and territories (ACT, NT, SA, Tas., WA) were less likely to have ever taken PEP (see Appendix B Table A6).

Use of PrEP

In the 2019 survey, over two in five participants (42.7%; n=521) reported having ever taken pre-exposure prophylaxis (PrEP) to reduce the chance of HIV infection (a significant increase from 3.0% in 2015 and 23.6% in 2017; both $p<.001$) (see Figure 2).

Figure 2. Participants who reported having ever received PEP and PrEP



Excluding HIV-positive men, over a third of participants (38.4%; n=441) reported that they were currently taking PrEP at the time of the 2019 survey (a significant increase from 2.1% in 2015 and 23.3% in 2017; $p<.001$). Almost all of these men (98.2%) reported that they were HIV-negative. Among men taking PrEP at the time of the survey (n=441), 27.9% reported that they had been taking PrEP for six months or less, 19.1% for 7–12 months, and 53.1% for more than 12 months. Almost all current PrEP users reported taking it daily (93.4%). Six participants (1.4%) reported taking it every other day, 20 participants (4.5%) reported taking it before and after sex (event-based dosing), and three participants (0.7%) had temporarily stopped taking PrEP.

Most participants who were currently taking PrEP reported accessing it via their doctor (83.7%), with smaller groups saying they had got it via a research study or demonstration project (33.6%), had purchased it from overseas (13.4%), or got it through other means (4.5%; categories not mutually exclusive). Of those who selected other means, six people (1.4%) reported obtaining PrEP from a sexual health clinic, six people (1.4%) from someone else who was taking PrEP, and one respondent (0.2%) got PrEP medication from an HIV-positive person.

There were no significant differences across states in the proportions of men who reported ever having taken PrEP ($p=.059$) or were currently taking PrEP ($p=.056$; see Appendix B Table A6).

Table 4. Characteristics of current PrEP users (n=441)

	n	%
State		
New South Wales	171	38.8
Victoria	125	28.3
Queensland	74	16.8
Others	71	16.1
Duration of PrEP use		
Less than 6 months	123	27.9
7–12 months	84	19.1
More than a year	234	53.1
Dosing schedule		
Daily	412	93.4
Every other day	6	1.4
Before and after sex (event-based dosing)	20	4.5
Stopped temporarily	3	0.7
Source of PrEPa		
Prescribed by doctor	369	83.7
A research study or demonstration project	148	33.6
Bought from overseas	59	13.4
A person taking PrEP	6	1.4
An HIV-positive person	1	0.2
Other	20	5.4
Any condomless anal intercourse with casual partners in the previous six months	355	80.5
Any condomless anal intercourse with regular partners in the previous six months	330	74.8

Proportions may not sum to 100% due to rounding.

[a] Not mutually exclusive categories

Characteristics of participants taking PrEP

The median age of participants taking PrEP at the time of the 2019 survey (n=441) was 37 years (IQR=30–46), and 95.0% identified as gay. Most men taking PrEP lived in NSW (38.8%) and Vic. (28.3%), with the remainder living in Qld (16.8%) and other states and territories (16.1%; see Table 4). Most had completed tertiary education (62.6%) and were in full-time employment (73.0%). One-hundred and three (23.4%) reported having a boyfriend, partner or husband, 150 (34.0%) reported having a fuck buddy (or fuck buddies), 79 (17.9%) reported both types of regular male partner, and 109 (24.7%) had no regular partner. In the six months prior to the survey, the majority of participants on PrEP reported condomless anal intercourse with regular male partners (74.8%) and casual male partners (80.5%).

Compared to HIV-negative and untested/unknown status participants not taking PrEP at the time of the survey, men taking PrEP were more likely to identify as gay (95.0% vs. 87.4%; $p<.001$), be in full-time employment (73.0% vs. 60.3%; $p<.05$), to report recent CAIC (80.5% vs. 28.0%; $p<.001$) or CAIR (74.8% vs.

48.4%; $p<.001$). Current PrEP users were less likely to identify as bisexual (3.9% vs. 11.6%; $p<.001$), less likely to be a student (10.0% vs. 15.7%) or employed part-time (6.6% vs. 13.4%; both $p<.05$), and less likely to live in states other than NSW, Vic. and Qld (16.1% vs. 22.1%; $p<.05$). Current PrEP use was unrelated to being born in Australia versus overseas, or education level.

Reasons for stopping PrEP

Of the 521 men who had ever used PrEP, 43 (8.3%) reported they had stopped taking it temporarily and 33 (6.3%) reported that they had stopped taking it permanently. All 76 participants who had stopped taking PrEP reported that they were HIV-negative. About half (48.7%) reported any condomless anal intercourse with casual partners in the six months prior to the survey, noting however that the survey did not distinguish whether this occurred before or after stopping PrEP. Table 5 shows the reasons reported for stopping PrEP; the categories are not mutually exclusive. The most common reasons for stopping PrEP were having less sex, being in a monogamous relationship or concerns about taking medication.

Table 5. Reasons for stopping PrEP (n=76)

	n	%
I was having less sex	38	50.0
I was in a monogamous relationship	25	32.9
I was concerned about taking medication	23	30.3
I was no longer at risk of HIV	20	26.3
I couldn't afford it	12	15.8
I had side effects from the medication	12	15.8
I had trouble remembering to take it	5	6.6
I was concerned about getting STIs	5	6.6

Awareness of PrEP

A small minority (2.5%, n=30) of participants reported having never heard of PrEP before completing the survey, 25.8% (n=315) reported having heard "a little" about PrEP, 29.0% (n=354) reported having heard "a lot", and the remainder (42.7%, n=521) were either currently taking or had previously taken PrEP. Most participants who had never heard of PrEP (57.7%, n=17) were HIV-negative and 43.3% (n=13) had never tested for HIV (i.e. they did not know their HIV status). The proportion of participants who had not heard of PrEP in 2019 was significantly lower than in 2017 (2.5% vs. 5.2%; $p<.001$). In 2019, there were no statistically significant differences between states and territories in levels of PrEP awareness (see Appendix B Table A7).

In 2019, three-quarters of participants (75.2%) reported that they knew someone who was taking PrEP, a significant increase from the 2017 survey (66.2%, $p<.001$). In 2019, 36.1% of participants reported that they knew up to five people who were taking PrEP, 10.9% knew between 6–10 people, and 28.2% knew more than 10 people taking PrEP. There were no significant differences between states and territories in the likelihood of knowing a PrEP user.

Among HIV-negative and untested/unknown status participants who had never taken PrEP (n=631), more than one-quarter of men (27.6%) reported having discussed PrEP with a doctor, a significant increase from the 2017 survey (19.2%, $p<.001$). Only three participants who were untested for HIV or of unknown status had discussed PrEP with a doctor. Men who had discussed PrEP with a doctor were more likely to reside in NSW (41.4%) and less likely to reside in Qld (12.6%; $p<.05$; see Appendix B Table A7).

Preference for taking PrEP

A new question was introduced in 2019 asking HIV-negative and untested/unknown participants their preferred method of taking PrEP, assuming that all methods were available and equally effective. Among current PrEP users, half (50.1%) indicated that their preferred way of taking PrEP was via a long-acting injection (every two to three months), a fifth (22.3%) preferred a daily pill, 17.7% preferred a long-acting, removable implant, and 8.4% preferred pills before and after sex (event-based dosing). Among non-PrEP-users, nearly one-third (32.7%) preferred a long-acting injection, 26.5% preferred event-based dosing, 21.6% preferred a daily pill, and 18.0% preferred a long-acting, removable implant. The remaining proportions of men entered a free text response, which included responses such as wanting a HIV vaccine, a topical gel, or interventions that also prevented STIs other than HIV. There were no statistically significant differences in the preferred ways to take PrEP between men from different states and territories.

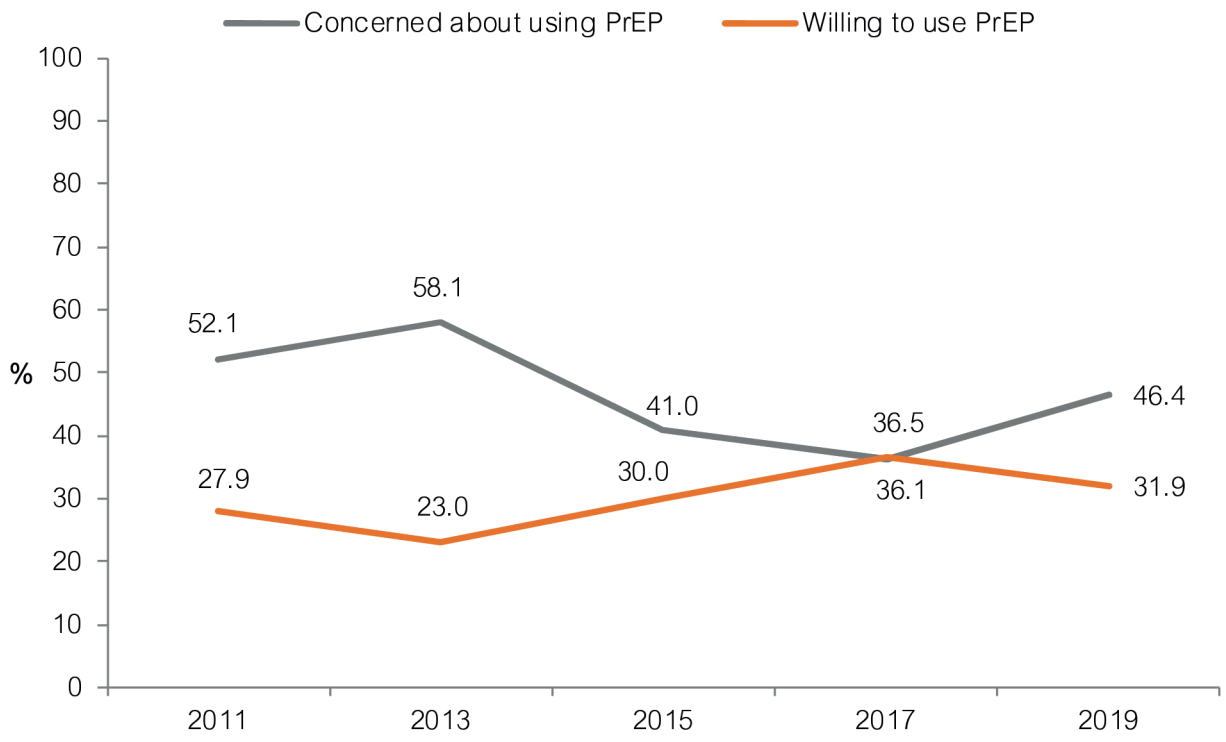
Attitudes towards taking PrEP

This section presents findings from four scales that examine attitudes towards taking PrEP among HIV-negative and untested/unknown status men. These analyses only include HIV-negative and untested/unknown status participants who have never taken PrEP (n=631). There were no statistically significant differences in attitudes toward taking PrEP across states and territories (see Appendix B Table A8).

Willingness to use PrEP

In 2019, the mean score on the *Willingness to use PrEP* scale was 3.6 (SD=0.8). Based on a score of ≥ 4 on the scale, 31.9% of HIV-negative/unknown status participants were categorised as willing to use PrEP. This represents a decrease from 36.5% who were willing to use PrEP in 2017 but this difference was not statistically significant (*p*=.12; see Figure 3).

Figure 3. Willingness to use PrEP and concern about using PrEP among HIV-negative and untested/unknown status men who had never taken PrEP



There were 212 HIV-negative and untested/unknown status men who were categorised as eligible to commence PrEP according to the criteria in Box 1; this represented 33.6% of HIV-negative and untested/unknown men, excluding current PrEP users. Of these, 212 men or 40.0% were categorised as willing to use PrEP, compared to 48.7% in 2017 and 41.1% in 2015. After controlling for the effect of demographic variables, this was not a statistically significant change from 2015 (p=.42), i.e. willingness to use PrEP among eligible men has remained stable since 2015.

Concern about using PrEP

In 2019, the mean score on the *Concern about using PrEP* scale was 3.6 (SD=1.0). Based on a score of ≥ 4 on the scale, 46.4% of HIV-negative and untested/unknown status participants were categorised as concerned about using PrEP, and 53.6% were categorised as unconcerned or neutral about using PrEP. This represents a significant increase from the 36.1% of participants who were concerned about using PrEP in 2017 (p=.001; see Figure 3).

Among the 212 HIV-negative/unknown status men in 2019 who were categorised as eligible to commence PrEP (see Box 1), 42.9% were categorised as concerned about using PrEP, which represents a significant increase from 28.7% of eligible men in 2017 (p=.046) and 32.4% of eligible men in 2015 (p=.003).

In 2019, the most common reasons for not using PrEP among eligible men (n=212) were concerns about side effects (38.2%) or long-term medication (34.9%), not having enough sex (34.0%), or using condoms (26.9%). Among the same group, the preferred ways to take PrEP were long-acting injections (35.6%), event-based dosing (23.3%), daily pills (22.8%), or implants (16.8%), assuming all were available and equally effective.

Box 1: Criteria used to determine PrEP eligibility

Participants were categorised as eligible to take PrEP if they were HIV-negative or untested/unknown status men who were not currently taking PrEP and who met any of the following criteria:

- HIV-positive regular partner with a detectable or unknown viral load.
- Any condomless anal intercourse with casual male partners in the previous 6 months.
- Any STI diagnosis in the previous 12 months.
- Any crystal methamphetamine use in the previous 6 months.

These criteria are an approximation of the PrEP eligibility criteria used to define gay and bisexual men who are at high risk of HIV, as recommended in the 2017 Australian PrEP prescribing guidelines (Wright et al., 2017). More relaxed prescribing guidelines have recently been released, but were not current at the time of the 2019 survey.

Likelihood of reduced condom use if using PrEP

Among men who were willing to use PrEP in 2019 (n=201), the mean score on the *Likelihood of decreased condom use if using PrEP* scale was 2.8 (SD=1.2). Based on a score of ≥ 4 on the scale, 21.9% of these men were categorised as likely to reduce condom use if they were taking PrEP and 78.1% were categorised as unlikely to or neutral about reducing condom use if they were taking PrEP. While there has been an increase in the proportion of participants likely to reduce condom use since 2011 (8.1% in 2011; p<.001), there was no significant change from 2017 (22.3% in 2017; p=.37).

Reduced HIV concern from PrEP

Among HIV-negative and untested/unknown status participants who had never taken PrEP (n=630), the mean score on the *Reduced HIV concern from PrEP* scale was 3.2 (SD=0.9).

Based on a score of ≥ 4 on the scale, 28.4% of HIV-negative and untested/unknown participants were categorised as having reduced concerns about HIV because of PrEP, and 71.6% were categorised as neutral or not having reduced concerns about HIV due to PrEP. This represents an increase from 24.1% who were categorised as having reduced concerns about HIV because of PrEP in 2017, however this change was not statistically significant (p=.08).

Attitudes towards PrEP among men taking PrEP

This section presents findings from two scales that were developed in 2017 that examine the attitudes of men who were taking PrEP at the time of the survey (n=441 in 2019).

Sexual confidence and reduced HIV concern from PrEP

The mean score on the *Sexual confidence and reduced HIV concern from PrEP* scale was 4.1 (SD=0.7). Based on a score of ≥ 4 on the scale, 65.3% of participants who were taking PrEP at the time of the 2019 survey were categorised as having increased sexual confidence and reduced HIV concerns because of PrEP, and 26.4% were categorised as neutral or as not having increased sexual confidence or reduced concerns about HIV. This represents a decrease from 73.6% of men in 2017 who were categorised as having increased sexual confidence and reduced HIV concerns because of PrEP (p=.007).

There were significant differences in the proportions of men who reported increased sexual confidence and reduced HIV concerns because of PrEP by state (NSW, 74.9%; Vic., 64.0%; Qld, 58.1%, other states and territories, 52.1%; p=.003). Men from NSW reported greater sexual confidence and reduced HIV concern because of PrEP compared to other states and territories, while men from less populous states and territories (ACT, NT, SA, Tas., WA) reported lower levels of confidence and reduced HIV concern compared to other states (both p<.05).

Concerns about PrEP disclosure

The mean score on the *Concerns about PrEP disclosure* scale was 2.0 (SD=1.0). Based on a score of ≥ 4 on the scale, 6.6% of participants who were taking PrEP at the time of the survey were categorised as concerned about disclosing to sexual partners or other people that they were taking PrEP, and 93.4% were categorised as unconcerned or neutral about disclosing that they were on PrEP. There was no significant change from the 7.4% of men who were categorised as being concerned about disclosing to sexual partners or other people that they were taking PrEP in 2017 (p=.67). Comparisons between jurisdictions could not be made due to small cell counts.

Attitudes towards other men taking PrEP

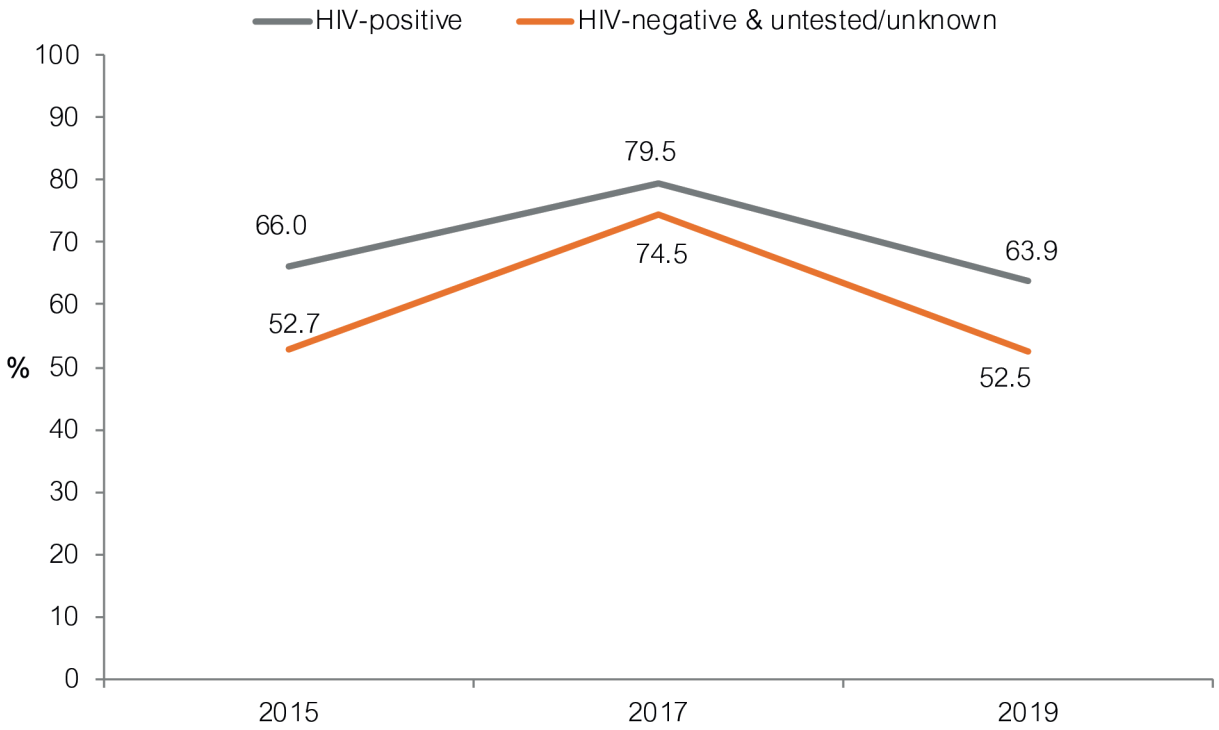
This section examines the attitudes of participants towards gay and bisexual men taking PrEP in general, and attitudes towards having sex with men on PrEP. These questions were completed by all participants except those who were taking PrEP at the time of the survey. There were no statistically significant differences in attitudes toward other men taking PrEP between states and territories (see Appendix B Table A9).

Support for GBM taking PrEP

In 2019, the mean score on the *Support for gay and bisexual men taking PrEP* scale was 3.9 (SD=0.7). Based on a score of ≥ 4 on the scale, 53.7% of participants (n=702) were categorised as being supportive of GBM taking PrEP, and 46.3% were categorised as unsupportive or neutral. There were no statistically significant differences between HIV-positive participants and HIV-negative and untested/unknown status participants in level of support for GBM taking PrEP (p=.15; see Figure 4).

When controlling for the effect of demographic variables, there has been no significant overall change between 2015 and 2019 in the proportions of both HIV-positive participants (p=.85) and HIV-negative/unknown status participants (p=.06) who were supportive of GBM taking PrEP (see Figure 4). However, as shown in Figure 4, between 2017 and 2019 there were significant decreases in support among HIV-positive participants (p=.021) and HIV-negative and untested/unknown status participants (p<.001).

Figure 4. Participants who were supportive of gay and bisexual men taking PrEP

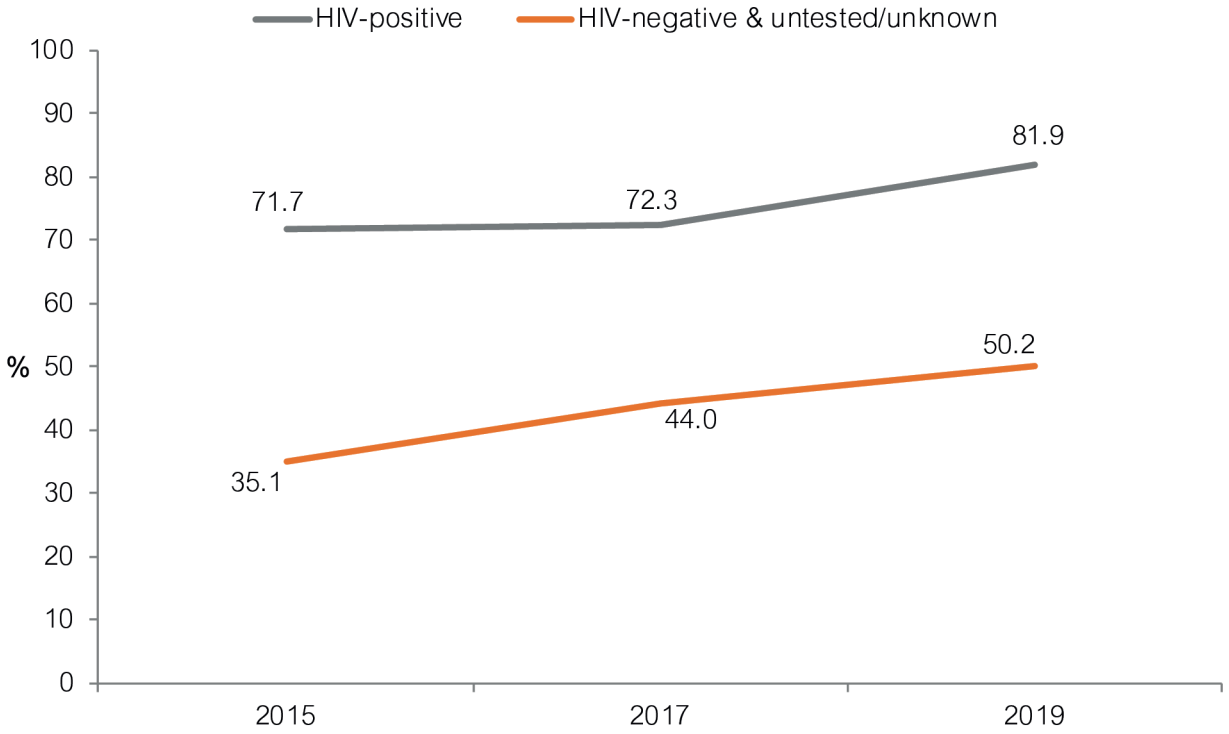


Willingness to have sex with GBM taking PrEP

In 2019, the mean score on the *Willingness to have sex with GBM taking PrEP* scale was 3.9 (SD=0.8). Based on a score of ≥ 4 on the scale, 53.4% of participants (n=702) were categorised as willing to have sex with GBM taking PrEP, and 46.6% were categorised as unwilling or neutral. HIV-positive participants were more likely than HIV-negative and untested/unknown status participants to be willing to have sex with GBM who were taking PrEP (81.9% vs. 50.2%; p<.001).

Between 2015 and 2019, there has been an increase in the proportion of HIV-negative/unknown status men who reported willingness to have sex with men on PrEP (up from 35.1% in 2015 to 50.2% in 2019; $p<.001$; see Figure 5). There was no statistically significant change in willingness among HIV-positive participants ($p=.06$).

Figure 5. Participants who reported willingness to have sex with men taking PrEP



Attitudes towards HIV treatment as prevention

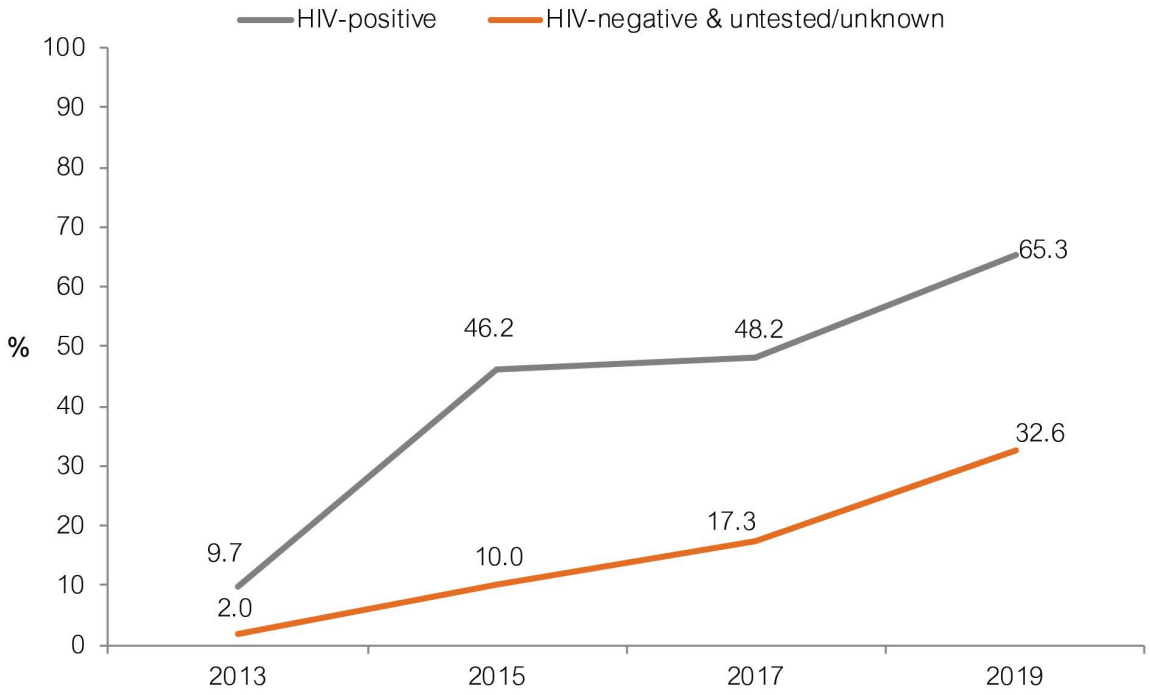
HIV treatment prevents transmission

In 2019, the mean score on the *HIV treatment prevents transmission* scale was 3.4 (SD=0.9) among HIV-negative and untested/unknown status participants (n=1,143), and 4.1 (SD=0.9) among HIV-positive participants (n=72; $p=.001$). Based on a score of ≥ 4 on the scale, 34.6% of all participants were categorised as believing that HIV treatment prevents transmission, an increase from 2.6% of all participants when this scale was introduced in 2013 ($p<.001$).

Since 2013, belief in TasP has remained much higher among HIV-positive participants compared to HIV-negative and untested/unknown status participants (65.3% vs. 32.6% in 2019, $p<.001$). Among both groups however, belief in TasP has increased substantially (both trends $p<.001$; see Figure 6).

Among HIV-negative and untested/unknown status participants in 2019, higher proportions of men in NSW, Vic. and Qld reported a belief in TasP compared to men in other states and territories ($p<.05$; see Appendix B Table A10).

Figure 6. Participants who agreed that HIV treatment prevents transmission



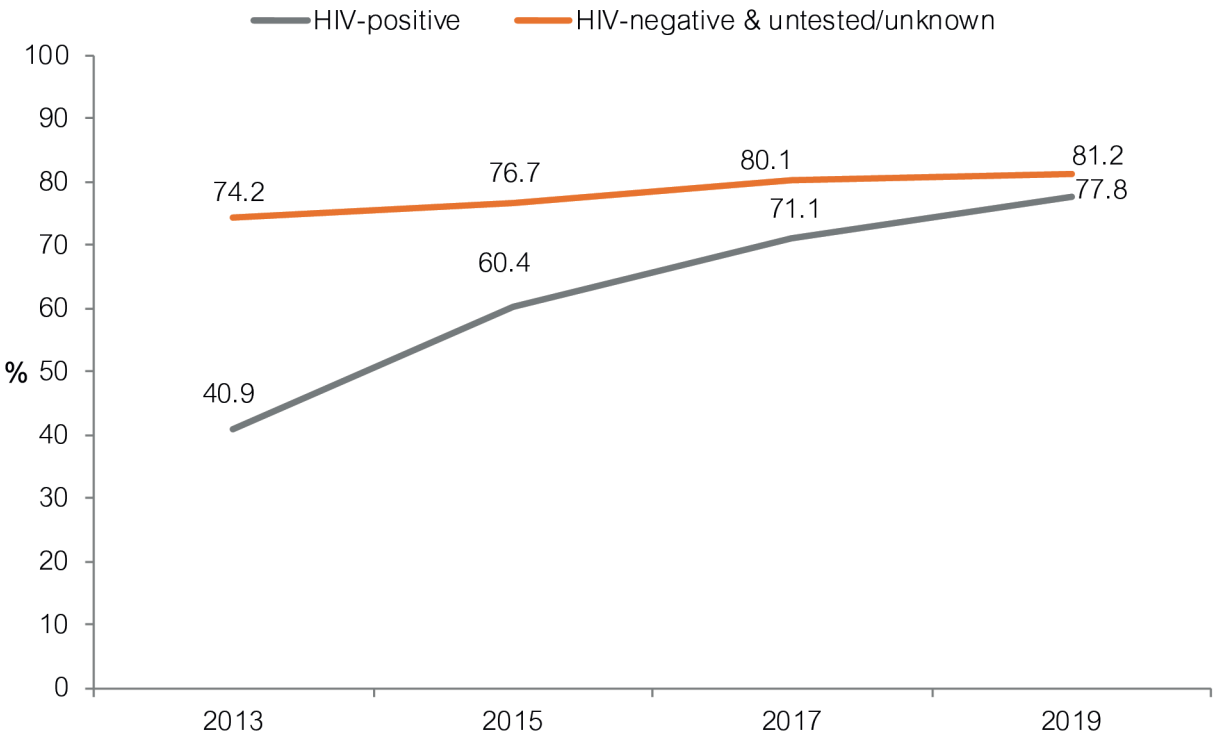
Early HIV treatment is necessary

In 2019, the mean score on the *Early HIV treatment is necessary* scale was 4.4 (SD=0.6) among HIV-negative and untested/unknown status participants, and 4.3 (SD=0.8) among HIV-positive participants (p=.82). Based on a score of ≥ 4 on the scale, 81.0% of all participants were classified as agreeing that early HIV treatment is necessary. This was not a significant change from 79.4% in 2017 (p=.26). There were no statistically significant differences in agreement that early HIV treatment is necessary between states and territories (see Appendix B Table A10).

More than three-quarters (81.2%) of HIV-negative and untested/unknown status participants and 77.8% of HIV-positive participants were categorised as believing that early HIV treatment is necessary in 2019. This was not a significant change from 2017 for HIV-negative and untested/unknown status participants (p=.41) nor HIV-positive participants when controlling for the effect of demographic variables (p=.18; see Figure 7).

However, since 2013, when these questions were first asked of participants, there has been an increase in belief in early HIV treatment among both HIV-negative and untested/unknown status participants (p<.001) and HIV-positive participants (p=.001). In previous surveys, HIV-positive men were less enthusiastic about early HIV treatment than HIV-negative/unknown status men. However, as shown in Figure 7, levels of belief that early HIV treatment is necessary appear to be converging among HIV-positive and HIV-negative and untested/unknown men.

Figure 7. Participants that agreed that early HIV treatment is necessary

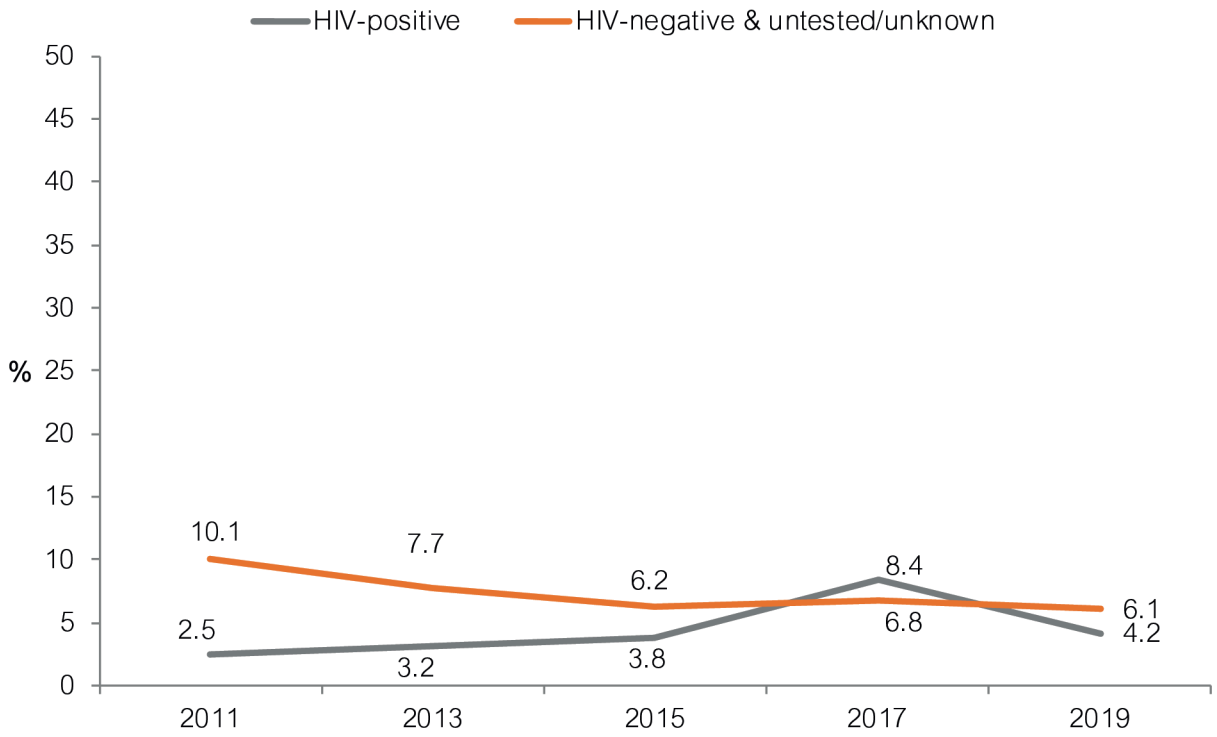


Attitudes towards condoms

Questions about attitudes towards condoms have been asked of all participants since the inception of the survey in 2011. Two scales, *Personal experience in using condoms* and *Confidence in discussing condoms with partners*, were examined. Our results indicate that most men have neutral or negative experiences in using condoms and that their confidence in using them (discussing them with partners) has declined since 2011. There were no statistically significant differences in attitudes towards condoms across states and territories (see Appendix B Table A11).

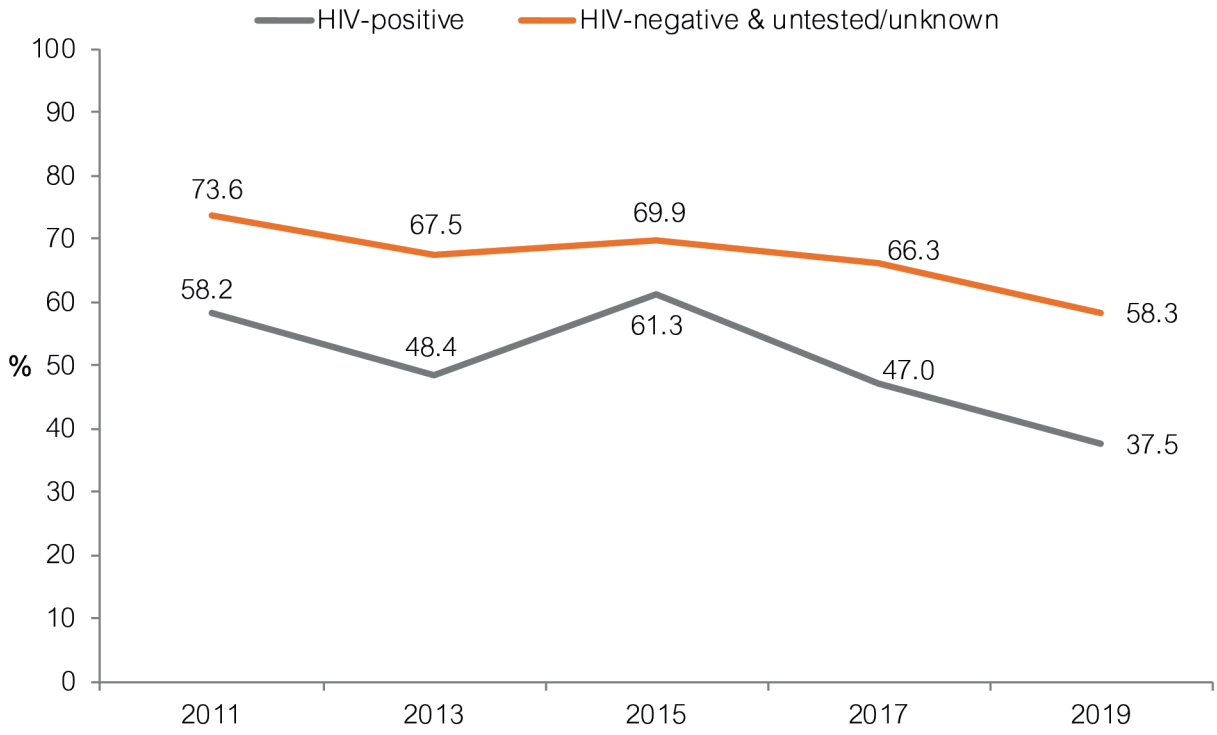
Based on scores of ≥ 4 on the *Personal experience in using condoms* scale, 6.1% of HIV-negative and untested/unknown status participants and 4.2% of HIV-positive participants in 2019 were classified as having positive experiences of using condoms (p=.50). There was no change in the proportion of participants reporting positive experiences of using condoms between 2017 and 2019 when controlling for the effect of demographic variables (HIV-negative/unknown status men, p=.41; HIV-positive men, p=.23). There was, however, a significant decrease in the proportion of HIV-negative and untested/unknown status men reporting a positive experience of using condoms from 10.1% in 2011 to 6.1% in 2019 (p=.001; see Figure 8). The experience of using condoms did not change among HIV-positive men between 2011 and 2019 (p=.27; Figure 8).

Figure 8. Participants who reported positive experiences of using condoms



Based on scores of ≥ 4 on the *Confidence in discussing condoms with partners* scale, 58.3% of HIV-negative and untested/unknown status participants and 37.5% of HIV-positive participants in 2019 were categorised as having confidence in discussing condoms with partners (p=.001). Between 2011 and 2019, confidence in discussing condoms fell among HIV-negative and untested/unknown status participants (from 73.6% to 58.3%, p<.001; see Figure 9) and among HIV-positive men (from 58.2% to 37.5%, p=.032; Figure 9). When controlling for the effect of demographic variables, the change from 2017 to 2019 among HIV-positive participants was not significant (p=.20).

Figure 9. Participants that reported confidence in discussing condoms with partners



Perceived effectiveness and acceptability of HIV prevention strategies

In 2019, there were high levels of perceived effectiveness and acceptability of PrEP, followed by condoms and sustained HIV treatment/undetectable viral load as HIV prevention strategies (see Table 6). There were lower levels of endorsement for the effectiveness and acceptability of serosorting.

HIV-positive participants were more likely than HIV-negative/untested participants to perceive that sustained HIV treatment/undetectable viral load (Mdn=5 vs. Mdn=4, $p<.001$) and PrEP (Mdn=4 vs. Mdn=4, $p=.042$) were *effective* prevention strategies. HIV-positive men were also more likely than HIV-negative and untested men to perceive serosorting (Mdn=3.5 vs. Mdn=3, $p=.001$), sustained HIV treatment/undetectable viral load (Mdn=5 vs. Mdn=4, $p<.001$), and PrEP (Mdn=5 vs. Mdn=5, $p<.001$) as *acceptable* prevention strategies. HIV-positive participants were less likely than HIV-negative and untested men to rate condoms as acceptable (Mdn=3 vs. Mdn=4, $p<.001$).

Between 2011 and 2017, condoms were considered by participants to be the most effective and acceptable HIV prevention strategy (see Table 6). However, since 2013, there has been a considerable increase in both the perceived effectiveness and acceptability of PrEP (both $p<.001$), with PrEP rated as the most acceptable strategy by the whole sample in 2019. Fewer men in the less populous states (ACT, NT, SA, Tas., WA) ranked PrEP as an effective prevention strategy compared to other locations, and more men in NSW ranked having an undetectable viral load as an effective strategy compared to other jurisdictions (see Appendix B Table A12).

Table 6. Perceived effectiveness and acceptability of HIV prevention strategies

	Perceived effectiveness				Acceptability			
	2013	2015	2017	2019	2013	2015	2017	2019
Condoms	4 (4, 5)	4 (4, 5)	4 (4, 5)	4 (4, 4)	5 (4, 5)	5 (4, 5)	5 (3, 5)	4 (3, 5)
Serosorting	3 (2, 4)	3 (2, 4)	3 (2, 4)	3 (2, 4)	3 (2, 4)	3 (2, 4)	3 (2, 4)	3 (2, 4)
PrEP	3 (3, 4)	4 (3, 4)	4 (4, 5)	4 (4, 5)	3 (2, 4)	4 (3, 5)	4 (3, 5)	5 (4, 5)
Early HIV treatment	3 (3, 4)	3 (3, 4)	-	-	4 (3, 5)	4 (3, 5)	-	-
Undetectable viral load	-	-	4 (3, 4)	4 (3, 5)	-	-	3 (2, 4)	4 (3, 5)

Note: Scores are median and interquartile range, ranging from 1 (not at all effective/acceptable) to 5 (completely effective/acceptable).

Perceived likeliness of acquiring HIV

In 2019, 2.6% of HIV-negative and untested/unknown status participants reported that they considered it likely or very likely that they "will become HIV-positive", which we regard as an indicator of perceived risk of HIV acquisition. PrEP users were less likely to consider themselves at risk of acquiring HIV compared to non-users (1.1% compared to 3.5%; $p=.013$). Since 2017, there has been a significant increase in the proportion of men who consider themselves unlikely or very unlikely to acquire HIV (from 77.9% to 85.6%; $p<.001$).

Alcohol and other drug use

In 2019, most participants (65.7%) reported using some recreational drugs (and/or drugs used for sex) in the previous six months (excluding alcohol). This is a similar level of drug use to that observed in the Gay Community Periodic Surveys in the eastern states of Australia (Broady, Lee, et al., 2019; Broady et al., 2018; Lee et al., 2018).

The most commonly used drugs in the previous six months were amyl nitrite (45.7%), erection medications (26.9%), cannabis (26.3%), and ecstasy (20.7%; see Table 7). Nearly one in five participants (18.8%) reported using "party drugs for the purpose of sex" in the previous six months and approximately 3.4% reported any injecting drug use in the previous six months (similar to the levels seen in the Gay Community Periodic Surveys) (Broady, Lee, et al., 2019; Broady et al., 2018; Lee et al., 2018). Approximately one-quarter of participants (26.6%) reported risky drinking at least weekly in the previous six months and another quarter of participants (27.0%) at least monthly. Risky drinking is defined as consuming four or more standard drinks in the same session according to Australian alcohol guidelines (National Health and Medical Research Council, 2009).

HIV-positive participants were more likely than HIV-negative/untested participants to report the use of any drug in the previous six months, and were more likely to report party drug use for sex and injecting drug use (see Table 7). Most of these comparisons were statistically significant ($p<.05$), with the exception of ecstasy, cocaine, ketamine and speed use. Participants in NSW were more likely than participants in other locations to report the use of ecstasy, cocaine, GHB, ketamine, and "party drugs" for the purpose of sex (all $p<.05$). Participants from NSW and Vic. were more likely than participants in other locations to report the use of amyl nitrite ($p<.05$; see Appendix B Table A13).

Between 2017 and 2019 there was a small increase in the proportion of participants who reported ketamine use (from 4.7% to 6.8%; $p=.031$) and decreases in the proportions of participants who reported crystal methamphetamine use (from 12.6% to 9.6%; $p=.022$) and cannabis use (from 34.9% to 26.3%, $p<.001$). There was no change between 2017 and 2019 in the proportions of participants reporting party drug use for sex or injecting drug use.

Table 7. Use of drugs other than alcohol in the previous six months

	HIV-negative & untested/unknown (n=1148)		HIV-positive (n=72)	
	n	%	n	%
Amyl nitrite	508	44.3	50	69.4
Cannabis	291	25.3	30	41.7
Erectile dysfunction medications (e.g., Viagra®, Cialis®, Levitra®)	303	26.4	45	62.5
Ecstasy and/or MDMA	236	20.6	17	23.6
Cocaine	200	17.4	16	22.2
Crystal methamphetamine	99	8.6	18	25.0
Gamma hydroxybutyrate (GHB)	91	7.9	14	19.4
Speed (powder methamphetamine)	61	5.3	6	8.3
Ketamine	77	6.7	6	8.3
Party drug use in sexual contexts	204	17.8	25	34.7
Injecting drug use	30	2.6	11	15.3

Discussion

The 2019 round of the PrEPARE Project has revealed a range of changes in the last two years, many of which appear tied to rapidly increasing levels of PrEP use by Australian gay and bisexual men, and increasing confidence in the benefits of HIV treatment, including for prevention. The survey results indicate both positive trends and some potential challenges in sustaining and embedding biomedical prevention strategies as part of a combination prevention approach.

Firstly, the 2019 survey attracted a high proportion of PrEP users, with 43% of the sample indicating they had ever used PrEP and 38% reporting that they were using PrEP at the time of the survey. This is the highest level of PrEP use recorded in any sample of Australian gay and bisexual men to date, and one of the highest recorded in the world (Broady, Lee, et al., 2019; Broady et al., 2018; Chen, Snowden, McFarland, & Raymond, 2016; Hammoud et al., 2019; Holt et al., 2019; Holt et al., 2018; Hood et al., 2016; Lee et al., 2018). However, as we noted after the 2017 survey, the PrEPARE Project almost certainly overrecruits gay and bisexual men on PrEP. We therefore believe that the levels of PrEP use found in routine behavioural surveillance are likely to be more accurate estimates of actual use. The most recent survey data from New South Wales and Victoria, for example, found that PrEP use was reported by about 30% of gay and bisexual men in early 2019 (Broady, Mao, et al., 2019; Broady, Power, et al., 2019). However, all the studies noted here agree that PrEP use by Australian gay and bisexual men has been rapidly increasing in metropolitan areas, particularly since 2016.

As PrEP use by Australian gay and bisexual men has increased, attitudes to it have also shifted, driven by growing awareness, personal experience and knowledge of other people using the technology. Nearly all men in the 2019 survey had heard of PrEP, and three-quarters of participants knew someone who was taking PrEP (a large increase since the 2017 survey). Among HIV-negative and untested men who had never previously used PrEP (just over half of the sample in 2019), we found that willingness to use PrEP plateaued and concern about using it increased between 2017 and 2019. We have discussed elsewhere how early PrEP uptake in Australia has been driven by gay and bisexual men who were most interested in the technology (often because of their sexual practices), and men who were more open to change and who had fewer concerns about taking medication (Holt et al., 2019). Diffusion of Innovations theory suggests that gay and bisexual men who have held back from engaging with PrEP may be more conservative, need greater reassurance that PrEP is effective and acceptable, and hold more reservations about taking medication to prevent HIV than men who are taking PrEP (Bertrand, 2004; Holt et al., 2019; Rogers, 1983). Our 2019 survey findings appear to align with that view. That said, when we focus our attention on men who are eligible for PrEP based on prescribing guidelines (Wright et al., 2017), willingness to use PrEP has remained stable at 40%, although concern about using it has risen. It is possible that more public and positive discussion of event-based dosing might address some concerns about taking medication, although we note that the preferred way to take PrEP was a long-acting injection, an option that is being trialled but is not currently available.

The experiences of the growing cohort of PrEP users in the 2019 survey appeared to be generally positive, with the majority of PrEP users reporting reduced concern about HIV and increased sexual pleasure as a result of PrEP, and few concerns about disclosing PrEP use to others. This echoes positive findings from overseas (Grace, Jollimore, MacPherson, Strang, & Tan, 2018; Hughes et al., 2018; Koester et al., 2017; Newman, Guta, Lacombe-Duncan, & Tepjan, 2018). However, the level of reduced HIV concern and increased pleasure among PrEP users fell between 2017 and 2019 and there was variability between different jurisdictions, with more positive ratings from PrEP users in NSW and Victoria than other jurisdictions. This suggests that there (currently) may be a more positive experience of PrEP in Australian jurisdictions with larger cohorts of PrEP users, as larger numbers of PrEP users may create a stronger sense of PrEP being

normal and accepted. The 2019 survey also captured a small but growing group of gay and bisexual men who had permanently or temporarily stopped using PrEP. These men tended to report that they were having less sex or had entered a monogamous relationship, or they had concerns about taking medication.

Attitudes towards PrEP among gay and bisexual men in general (rather than just prospective or current users) presented a mixed picture in 2019, with support for PrEP users dropping (although the majority remained supportive), and willingness to have sex with PrEP users increasing. It is unclear why support would plateau or taper off in 2019 while willingness to have sex with PrEP users continued to increase, although we note that these measures (about support for PrEP users, for example) are directed at HIV-negative and untested who are not using PrEP, and HIV-positive men. As noted above, the group of HIV-negative and untested men who have not used PrEP is becoming smaller over time, and may have more conservative attitudes to PrEP than the growing cohort of PrEP users (Holt et al., 2019). This suggests uneven effects of PrEP implementation at a community level, and that even with growing levels of use, it may be necessary to continue to discuss its benefits for HIV prevention to maintain a supportive community environment.

Shifting our attention to HIV treatment as prevention, the 2019 survey found higher levels of belief that HIV treatment prevents transmission, continuing the slow but steady increase in this indicator over the last few survey rounds (Holt, Lea, Schmidt, et al., 2016; Lea et al., 2018). The majority of HIV-positive men (65%) now believe that HIV treatment prevents transmission, while a third of HIV-negative and untested men (33%) reported the same belief. While this is a positive change, particularly for HIV-positive men and their partners, it does demonstrate continuing scepticism about the benefits of HIV treatment for prevention among the majority of gay and bisexual men, despite the vast majority of HIV-positive men in the sample being on treatment and having an undetectable viral load, and ongoing community education efforts, including the global "U=U" (undetectable = untransmittable) movement. In contrast, support for early HIV treatment (which focuses on the health benefits of treatment) was reported by 81% of the 2019 sample, with high levels of continuing support among HIV-negative and untested men, and, perhaps more importantly, increased levels of support among HIV-positive men. As we have previously noted, HIV-positive men may have been reticent to endorse early HIV treatment before, as it could imply starting treatment before one is ready, or not being given a choice about whether to start treatment or not (Holt, Lea, Schmidt, et al., 2016). However, there appears to be a greater awareness that there are few if any benefits to the health of HIV-positive people by delaying treatment (Cohen et al., 2011).

The PrEPARE Project has shown us that attitudes to condoms have also shifted as awareness, knowledge and use of PrEP and treatment as prevention have increased. We have previously found that few men report a positive experience of using condoms, yet most men were confident discussing condoms with partners, illustrating the successful maintenance of a strategy that most participants did not find particularly pleasurable (Lea et al., 2018). However, we now see that confidence discussing condoms with partners is dropping. This presumably reflects the growing cohort of men who are relying on PrEP and treatment as prevention (rather than condoms) for primary prevention, and the mixture of strategies that is now used by gay and bisexual men. It may also reflect changing norms about acceptable prevention strategies (see below), with condoms now seen as an option (rather than an imperative). Whether this makes sexual negotiation more difficult, particularly for men who continue to rely on condoms as their primary strategy, is worthy of investigation. For men who choose to use condoms as their primary prevention strategy, they may require additional education and support to maintain skills and successfully negotiate with partners, given the range of effective strategies now in use.

Finally, we have asked about the perceived effectiveness and acceptability of different prevention strategies since 2013. In the 2013–17 period, condoms were consistently rated as the most effective and acceptable prevention strategy. However, in the last two years we have seen a shift with PrEP and treatment as prevention being rated as effective as condoms (echoing community education messages), and PrEP becoming the most acceptable strategy in the sample in 2019. This undoubtedly reflects the growing cohort of PrEP users within the sample over time, but we believe it also illustrates the growing confidence in and acceptability of biomedical prevention strategies among Australian gay and bisexual men.

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Appendix A – Statistical analyses

Aggregated national data are presented for all the findings. Because the primary funding for the survey was from the NSW Ministry of Health, statistical comparisons between NSW and other jurisdictions were performed for most findings. NSW data are only reported in the text when there were statistically significant differences between NSW and other jurisdictions. Comparisons on each of the survey measures between NSW, Victoria and Queensland are shown in Appendix B. Data from other states and territories were grouped together due to the smaller number of participants from these jurisdictions.

Chi-squared tests were used to examine differences between categorical idependent and dependent variables. Significant associations in larger than 2 x 2 contingency tables were interpreted using Pearson standardised residuals for each cell. Standardised residuals exceeding +/-2 in absolute value were interpreted as significant ($p<.05$) (Agresti, 2013). Other non-parametric tests (such as the Wilcoxon rank-sum and the Kruskal-Wallis test) were used to examine differences between categorical independent variables and ordinal dependent variables (Likert scales), as well as to examine differences between categorical independent variables and continuous dependent variables, due to the non-normal distribution of scores on the continuous variables. Trends in behavioural characteristics over time were assessed with multivariate logistic regression, with the outcome of interest as dependent variable. The independent variables were the survey year and relevant demographic variables to control for variations in sampling. These included age, sexuality, education, employment, state, region, and whether participants were born overseas. Statistical significance was set at $p<.05$. All analyses were conducted using Stata Version 14.2.

Appendix B – Reporting

Table A1. Demographic characteristics (%)

	All (N=1,220)	NSW (n=440)	Vic. (n=320)	Qld (n=221)	Other states/ territories (n=239)
Age (Mdn, IQR)	35.5 (28–46)	37 (29–48)	34.5 (27–45.5)	35 (28–46)	34 (26–45)
Sexual identity					
Gay	90.6	91.4	91.6	91.0	87.5
Bisexual / other	9.4	8.6	8.4	9.0	12.5
HIV status					
HIV-negative	84.4	87.5	83.8	86.0	78.2
HIV-positive	5.9	6.8	5.3	5.9	5.0
Untested / unknown status	9.7	5.7	10.9	8.1	16.7
Country of birth					
Australia	73.6	70.7	75.3	74.7	75.7
Overseas	26.4	29.3	24.7	25.3	24.3
Aboriginal and/or Torres Strait Islander					
Yes	3.1	2.7	2.5	4.1	3.8
No	96.9	97.3	97.5	95.9	96.2
Highest level of education					
Up to year 12	23.5	21.1	21.6	28.6	25.9
Trade certificate	17.9	17.3	15.3	15.8	24.3
Undergraduate degree	31.4	31.4	35.0	31.2	26.8
Postgraduate degree	27.2	30.2	28.1	24.4	23.0
Employment status					
Full-time	65.2	67.5	65.9	61.1	63.6
Part-time	10.7	8.9	10.0	16.3	10.0
Student	13.0	12.1	13.4	10.9	15.9
Unemployed/retired/other	11.1	11.5	10.7	11.7	10.5
Residential location					
Capital city	72.0	72.5	77.5	59.7	74.9
Other city	11.6	10.7	10.0	19.5	8.0
Regional centre/town	13.3	14.3	10.7	18.1	10.5
Rural or remote area	3.2	2.5	1.9	2.7	6.7

Mdn; median, IQR; interquartile range.

Table A2. HIV testing and status (%)

	All	NSW	Vic.	Qld	Other states/ territories
Ever tested	**(N=1,220)**	**(n=440)**	**(n=320)**	**(n=221)**	**(n=239)**
All participants	91.5	95.0	90.9	92.3	84.9
Non-HIV-positive participants	**(N=1,044)**	**(n=388)**	**(n=274)**	**(n=191)**	**(n=191)**
Tested in past 12 months	82.4	85.8	83.2	78.0	78.5
HIV test result	**(N=1,220)**	**(n=440)**	**(n=320)**	**(n=221)**	**(n=239)**
HIV-positive	5.9	6.8	5.3	5.9	5.0
HIV-negative	84.4	87.5	83.8	86.0	78.2
Untested / unknown status	9.7	5.7	10.9	8.1	16.7

Table A3. HIV treatment and viral load among HIV-positive participants (%)

	All (N=71)	NSW (n=30)^	Vic. (n=17)^	Qld (n=13)^	Other states/ territories (n=11)^
Currently on antiretroviral treatment	98.6	-	-	-	-
Undetectable viral load	94.4	-	-	-	-

^Not reported due to small cell counts.

Table A4. STI testing and diagnosis (%)

	All (N=1,220)	NSW (n=440)	Vic. (n=320)	Qld (n=221)	Other states/ territories (n=239)
STI testing					
Ever	88.9	91.1	90.3	90.5	81.6
Past 12 months	72.5	77.7	73.8	68.8	64.9
STI diagnosis					
Past 12 months	28.9	32.1	32.8	25.3	21.3

Table A5. Current relationships and sex with regular and casual male partners in the six months prior to the survey (%)

	HIV-negative & untested/unknown					HIV-positive[a]
	All (N=1,148)	NSW (n=410)	Vic. (n=303)	Qld (n=208)	Other states/ territories (n=227)	All (N=72)
Relationships with regular partner[b]						
No regular partner (or fuck buddy only)	56.4	56.9	52.5	58.7	59.0	55.6
Monogamous relationship	17.5	15.1	18.8	18.8	18.9	13.9
Non-monogamous relationship	14.6	15.6	18.5	9.6	12.3	19.4
No response	11.5	12.7	10.2	13.0	9.7	11.1
HIV status of regular partner[b]						
No regular partner (or fuck buddy only)	56.4	56.6	52.5	58.7	59.0	55.6
HIV-negative	36.1	36.6	40.6	33.7	31.3	26.4
Untested/unknown status	3.6	2.7	3.6	3.4	5.3	-
HIV-positive	4.0	4.2	3.3	4.3	4.4	18.1
Anal intercourse with regular partners						
No partner / no intercourse	30.7	32.4	29.4	28.4	31.3	40.3
Consistent condom use	10.8	9.0	8.9	13.0	14.5	2.8
Any anal intercourse without condoms	58.5	58.5	61.7	58.7	54.2	56.9
Anal intercourse with casual partners						
No partner / no intercourse	34.3	30.7	34.3	41.8	33.9	37.5
Consistent condom use	17.5	16.6	15.5	17.3	22.0	2.8
Any anal intercourse without condoms	48.2	52.7	50.2	40.9	44.1	59.7

a Data from individual states for HIV-positive participants cannot be reported in this table due to small cell counts.

b Data for this variable includes only regular partners classified as boyfriends, partner or husbands etc.

Table A6. Use of PEP and PrEP (%)

	All	NSW	Vic.	Qld	Other states/ territories
All participants	**(N=1,220)**	**(n=440)**	**(n=320)**	**(n=221)**	**(n=239)**
Ever taken PEP	20.5	23.4	23.4	17.7	13.8
Ever taken PrEP	42.7	45.2	45.6	41.2	35.6
HIV-negative and untested/unknown participants	**(N=1,148)**	**(n=410)**	**(n=303)**	**(n=208)**	**(n=227)**
Currently taking PrEP	38.4	41.7	41.3	35.6	31.3

Table A7. Awareness of PrEP among HIV-negative and untested/unknown participants who have never taken PrEP (%)

	All (N=631)	NSW (n=212)	Vic. (n=158)	Qld (n=117)	Other states/ territories (n=144)
Never heard of PrEP	4.8	3.3	4.4	6.8	5.6
Know at least one person who is taking PrEP	63.4	65.1	62.7	59.0	65.3
Have discussed PrEP with a doctor	27.6	34.0	30.4	18.8	22.2

Table A8. Attitudes towards PrEP among HIV-negative and untested/unknown participants who have never taken PrEP (%)

Scale score ≥ 4	All (N=631)	NSW (n=211)	Vic. (n=158)	Qld (n=117)	Other states/ territories (n=144)
Willing to use PrEP	31.9	28.3	33.5	30.8	36.1
Concerned about using PrEP	46.4	48.6	49.4	43.6	42.4
Reduced HIV concern from PrEP	28.4	28.0	27.9	28.2	29.9
Men willing to use PrEP	**(N=201)**	**(n=60)**	**(n=53)**	**(n=36)**	**(n=52)**
Likely to reduce condom use if using PrEP	21.9	26.7	18.9	16.7	23.1

Table A9. Attitudes towards gay and bisexual men taking PrEP among men who have never used PrEP (%)

Scale score ≥ 4	All	NSW	Vic.	Qld	Other states/ territories
HIV-negative and untested/unknown participants	**(N=631)**	**(n=212)**	**(n=158)**	**(n=117)**	**(n=144)**
Support GBM taking PrEP	52.5	52.8	55.1	49.6	51.4
Willing to have sex with GBM taking PrEP	50.1	51.4	49.4	51.3	47.9
HIV-positive participants	**(N=68)**	**(n=29)**	**(n=16)^**	**(n=13)^**	**(n=10)^**
Support GBM taking PrEP	66.2	58.6	-	-	-
Willing to have sex with GBM taking PrEP	85.3	82.8	-	-	-

[a] Excludes participants with HIV-positive regular partners.

^ Not be reported due to small cell counts.

Table A10. Attitudes towards HIV treatment as prevention (%)

Scale score ≥ 4	All	NSW	Vic.	Qld	Other states/ territories
HIV-negative and untested/unknown participants	**(N=1,143)**	**(n=410)**	**(n=303)**	**(n=208)**	**(n=227)**
HIV treatment prevents transmission	32.6	35.7	36.8	27.5	26.2
Early HIV treatment is necessary	81.2	80.4	83.1	77.8	83.1
HIV-positive participants	**(N=72)**	**(n=30)**	**(n=17)**	**(n=13)^**	**(n=12)^**
HIV treatment prevents transmission	65.3	53.3	88.2	-	-
Early HIV treatment is necessary	77.8	76.7	76.5	-	-

^ Not be reported due to small cell counts.

Table A11. Attitudes towards condoms (%)

Scale score ≥ 4	All	NSW	Vic.	Qld	Other states/ territories
HIV-negative and untested/unknown participants	**(N=1,148)**	**(n=410)**	**(n=303)**	**(n=208)**	**(n=227)**
Positive experience in using condoms	6.1	6.3	5.0	7.2	6.2
Confident discussing condoms with partners	57.8	55.9	57.1	62.0	58.6
HIV-positive participants	**(N=72)**	**(n=30)^**	**(n=17)^**	**(n=13)^**	**(n=12)**
Positive experience in using condoms	4.2	-	-	-	-
Confident discussing condoms with partners	37.5	43.3	35.3	-	-

^Not be reported due to small cell counts.

Table A12. Perceived effectiveness and acceptability of HIV prevention strategies

	Perceived effectiveness					Acceptability				
	All	NSW	Vic.	Qld	Other states/ territories	All	NSW	Vic.	Qld	Other states/ territories
Condoms	4 (4, 5)	4 (4, 5)	4 (4, 4)	4 (4, 4)	4 (4, 4)	4 (3, 5)	4 (3, 5)	4.5 (3, 5)	4 (3, 5)	5 (3, 5)
Serosorting	3 (2, 4)	3 (2, 4)	3 (2, 4)	3 (2, 4)	3 (2, 4)	3 (2, 4)	3 (2, 4)	3 (2, 4)	3 (2, 4)	3 (2, 4)
PrEP	4 (3, 5)	4 (4, 5)	4 (4, 5)	4 (4, 5)	4 (4, 4)	5 (4, 5)	5 (4, 5)	4 (4, 5)	5 (4, 5)	5 (4, 5)
Sustained HIV treatment/ undetectable viral load	4 (4, 5)	4 (4, 5)	4 (3, 5)	4 (3, 5)	4 (3, 4)	4 (3, 5)	4 (3, 5)	4 (3, 5)	4 (3, 5)	3 (2, 5)

Scores are median and interquartile range, ranging from 1 (not at all effective/acceptable) to 5 (completely effective/acceptable).

Table A13. Use of drugs other than alcohol in the previous six months (%)

	All (N=1,220)	NSW (n=440)	Vic. (n=320)	Qld (n=221)	Other states/ territories (n=239)
Amyl nitrite	45.7	49.8	50.9	38.5	38.1
Cannabis	26.3	29.3	26.6	23.5	23.0
Erection medications	28.5	32.5	28.8	23.5	25.5
Ecstasy and/or MDMA	20.8	28.0	20.9	12.7	14.6
Cocaine	17.7	23.4	21.3	10.9	8.8
Crystal methamphetamine	9.6	11.1	9.1	10.0	7.1
Gamma hydroxybutyrate (GHB)	8.6	15.7	6.3	3.6	3.4
Speed (powder methamphetamine)	5.5	5.5	5.6	3.6	7.1
Ketamine	6.8	11.4	7.8	n=3	n=5
Party drug use in sexual contexts	18.8	21.8	21.9	14.9	12.6
Injecting drug use	3.4	3.9	2.5	3.2	3.8