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Changing attitudes to and engagement with biomedical HIV prevention by gay and bisexual men: key findings from the PrEPARE Project 2017



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BBV & STI RESEARCH, INTERVENTION
AND STRATEGIC EVALUATION



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Acronyms

ANOVA	analysis of variance
CAIC	condomless intercourse with casual male partners
CAIR	condomless intercourse with regular male partners
GBM	gay and bisexual men
HCV	hepatitis C virus
HIV	human immunodeficiency syndrome
M	mean
NSW	New South Wales
PEP	post-exposure prophylaxis
PrEP	pre-exposure prophylaxis
QLD	Queensland
SD	standard deviation
STI	sexually transmissible infection
TasP	treatment as prevention
VIC	Victoria

Key findings from the 2017 survey

- » Nearly a quarter of gay and bisexual men (24%) reported they had ever used PrEP. This was a large increase from the 2015 survey (3%).
- » Most current PrEP users were accessing it from a research study or demonstration project (82%) and the majority (74%) reported increased sexual confidence and reduced concern about acquiring HIV as a result of PrEP.
- » Nearly all participants (95%) had heard of PrEP and two-thirds of participants (66%) knew someone who had taken PrEP; substantial increases from the 2015 survey. Knowledge of PrEP also improved between 2015 and 2017.
- » Willingness to use PrEP has increased among HIV-negative and untested men (to 37% in 2017) and concern about using it has fallen (to 36%).
- » Support for gay and bisexual men using PrEP increased to 75% in 2017, as did willingness to have sex with someone using PrEP (47%).
- » Belief that HIV treatment prevents transmission increased to 20% in 2017; the increase was primarily among HIV-negative and untested men.
- » Agreement that early HIV treatment is necessary increased to 79% in 2017; this increase was concentrated among HIV-positive men.

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 since then (Lea et al., 2015). 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 <http://prepareproject.csrh.org>

This report focuses on the 2017 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 2017 survey round, data were collected between April and May using KeySurvey online survey software. Data collection occurred at a similar time of year in 2011, 2013 and 2015. As in previous rounds, the 2017 survey was promoted on Facebook using paid advertisements targeting GBM across Australia, paid advertisements on social and sexual networking smartphone apps popular among GBM, and the Facebook pages, Twitter feeds and other social media platforms of community-based HIV and lesbian, gay, bisexual, transgender and intersex (LGBTI) organisations. In addition, participants from the 2015 PrEPARE survey who consented to being contacted about future research were invited to participate via email.

Potential participants were directed to the survey website, <http://prepareproject.csrh.org>, 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
- identified as gay or bisexual, and
- lived in Australia.

In 2017, 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).

Participants who did not identify their current gender as male were excluded 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. Participants who identified as intersex were categorised as intersex irrespective of the gender they were assigned at birth.

Knowledge about PrEP

Ten true or false knowledge items were included in both the 2015 and 2017 surveys. In 2017, one new item was included: “Australians can import PrEP drugs from overseas for personal use”.

Attitudes towards PrEP, HIV treatments and condoms

Reliable scales that were used in previous survey rounds were included in the 2017 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., 2015).

The following scales (introduced in 2011) were administered to all HIV-negative and untested/unknown status participants who had never taken PrEP:

- *Willingness to use PrEP* (7 items)
- *Concern about using PrEP* (2 items)
- *Likelihood of decreased condom use if using PrEP* (2 items).

The following scales (introduced in 2015) were administered to all participants who were not taking PrEP at the time of survey:

- *Support for gay and bisexual men taking PrEP* (7 items)
- *Willingness to have sex with men taking PrEP* (3 items)
- *Expecting sex partners to use PrEP* (2 items); not asked of participants who had HIV-positive regular partners at the time of the survey.

The following scales were administered to all participants:

- *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.

In 2017, three new items were introduced to examine concerns about HIV because of PrEP, and administered to HIV-negative and untested/unknown participants who had never taken PrEP. These items were: “I am less worried about getting HIV because of PrEP”, “I am less worried about having sex without condoms because of PrEP”, and “HIV is less of a threat because more people are taking PrEP”. All of these items were rated from ‘strongly disagree’ (=1) to ‘strongly agree’ (=5). These items formed a reliable scale (Cronbach’s $\alpha=.71$), which we have called Reduced HIV concern from PrEP. Mean scores on the scale ranged from 1 to 5, and participants who scored ≥ 4 on the scale were categorised as having reduced concerns about HIV because of PrEP.

In 2017, participants who were taking PrEP at the time of the survey were asked to respond to 11 new items about their attitudes towards and experiences of taking PrEP. All of these items were rated from ‘strongly disagree’ (=1) to ‘strongly agree’ (=5). Principal components factor analysis on these items resulted in two reliable scales:

- *Sexual confidence and reduced HIV concern from PrEP* (4 items; Cronbach’s $\alpha=.78$). Included items were: “I am less worried about getting HIV because of PrEP”, “I am less worried about having sex without condoms because of PrEP”, “Being on PrEP makes me feel confident about sex”, and “Sex is more pleasurable now I am on PrEP”. Mean scores on the scale ranged from 1 to 5. Participants who scored ≥ 4 on the scale were categorised as having increased sexual confidence and reduced concern about HIV attributable to PrEP.
- *Concerns about PrEP disclosure* (3 items; Cronbach’s $\alpha=.83$). Included items were: “I am concerned about people knowing I am on PrEP”, “I am careful who I tell that I am on PrEP”, and “I worry about people’s reactions when I tell them I am taking PrEP”. Mean scores on the scale ranged from 1 to 5. Participants who scored ≥ 4 on the scale were categorised as being concerned about disclosing their PrEP use to others.

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).

Statistical analyses

Aggregated national data are presented for all the findings. Because the primary funding for survey is 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,

although all relevant comparisons are shown in the Appendix tables. Only data from NSW, Victoria (VIC) and Queensland (QLD) are in the Appendix due to the relatively small number of participants from the other states and territories.

Chi-square tests were used to examine differences between two categorical variables. Independent samples t-tests and one-way analyses of variance (ANOVA) were used to examine differences between categorical independent variables and continuous dependent variables. Trends for each scale were assessed with logistic regression, controlling for demographic and behavioural variables that had statistically significant changes over time. Statistical significance was set at $p < .05$. All analyses were conducted using Stata Version 13.1.

Results

Sample characteristics

In 2017, 1,660 participants who met the eligibility criteria and provided informed consent began the survey. Of these, 1,121 men completed it (67.5% completion rate). Of those who completed the survey, almost one third resided in NSW (31.0%), one third in VIC (32.6%) and one sixth in QLD (16.9%; see Table 1). More than two-thirds of participants (70.8%) lived in the capital city of their state or territory.

Table 1 Residential location of participants (n=1,121)

	n	%
State or territory		
Australian Capital Territory	28	2.5
New South Wales	347	31.0
Northern Territory	10	0.9
Queensland	189	16.9
South Australia	70	6.2
Tasmania	27	2.4
Victoria	365	32.6
Western Australia	85	7.6
Residential location		
Capital city	794	70.8
Other city	129	11.5
Regional centre/town	158	14.1
Rural or remote area	40	3.6

The mean age of the sample was 37 years. A minority of participants was categorised as transgender men (2.9%, n=32) or intersex (1.9%, n=21) according to their responses to questions about current gender, gender assigned at birth and intersex status.

The majority of participants identified as gay (95.1%), were born in Australia (80.0%), had completed tertiary education (67.0%), and were employed full-time (64.0%; 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). NSW respondents were more likely than respondents in other locations to have a tertiary education ($p=.006$) and to be employed full-time ($p=.005$; see Appendix Table A1).

The majority of participants reported hearing about the survey via Facebook (87.4%), with the remainder hearing about the survey via Instagram (4.8%), an advertisement or article on an organisation's website, app or social media (3.7%), via a friend (2.1%), or via email or Twitter (2.0%).

Table 2 Demographic characteristics of participants (n=1,121)

	n	%
Age (M, SD)	36.9	12.2
Sexual identity		
Gay	1,066	95.1
Bisexual	39	3.5
Other	16	1.4
Country of birth		
Australia	897	80.0
Overseas	224	20.0
Aboriginal and/or Torres Strait Islander		
Yes	31	2.8
No	1,090	97.2
Highest level of education		
Up to year 12	340	30.3
Trade certificate	269	24.0
Undergraduate degree	269	26.7
Postgraduate degree	213	19.0
Employment status		
Full-time	717	64.0
Part-time	126	11.2
Student	119	10.6
Unemployed/retired/other	159	14.2

M, mean; SD, standard deviation.

HIV testing, status and treatment

Most men reported having ever tested for HIV (92.5%). According to self-report, 84.0% (n=942) of participants were HIV-negative, 7.4% (n=83) were HIV-positive, and 8.6% (n=96) were untested or of unknown HIV status. Among non-HIV-positive participants, 73.8% reported testing for HIV in the 12 months prior to the survey. Respondents in NSW and VIC were more likely than men in other locations to report having ever been tested for HIV ($p=.006$) and more likely than respondents in locations other than QLD to report testing in the previous 12 months ($p=.01$; see Appendix Table A2). Among HIV-positive participants, 94.0% were currently receiving antiretroviral treatments for HIV and 92.8% reported

having an undetectable viral load when they were last tested (see Appendix Table A3 for comparisons between jurisdictions).

STI and hepatitis C testing and diagnoses

Most men (89.1%) 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 (72.4%). One-quarter of respondents (24.5%) reported having been diagnosed with an STI in the previous 12 months.

Respondents in NSW and VIC were more likely than respondents in other locations to have ever had a STI test ($p<.001$), while NSW respondents were more likely than respondents in locations other than VIC to have tested in the previous 12 months ($p<.001$). NSW respondents were also more likely than respondents in locations other than VIC and QLD to have been diagnosed with an STI in the previous 12 months ($p<.001$; see Appendix Table A4).

More than three-quarters of men (78.8%) reported having ever been tested for hepatitis C (HCV). Ten respondents (0.9%) reported that they were currently living with chronic HCV.

Sex with men in the previous six months

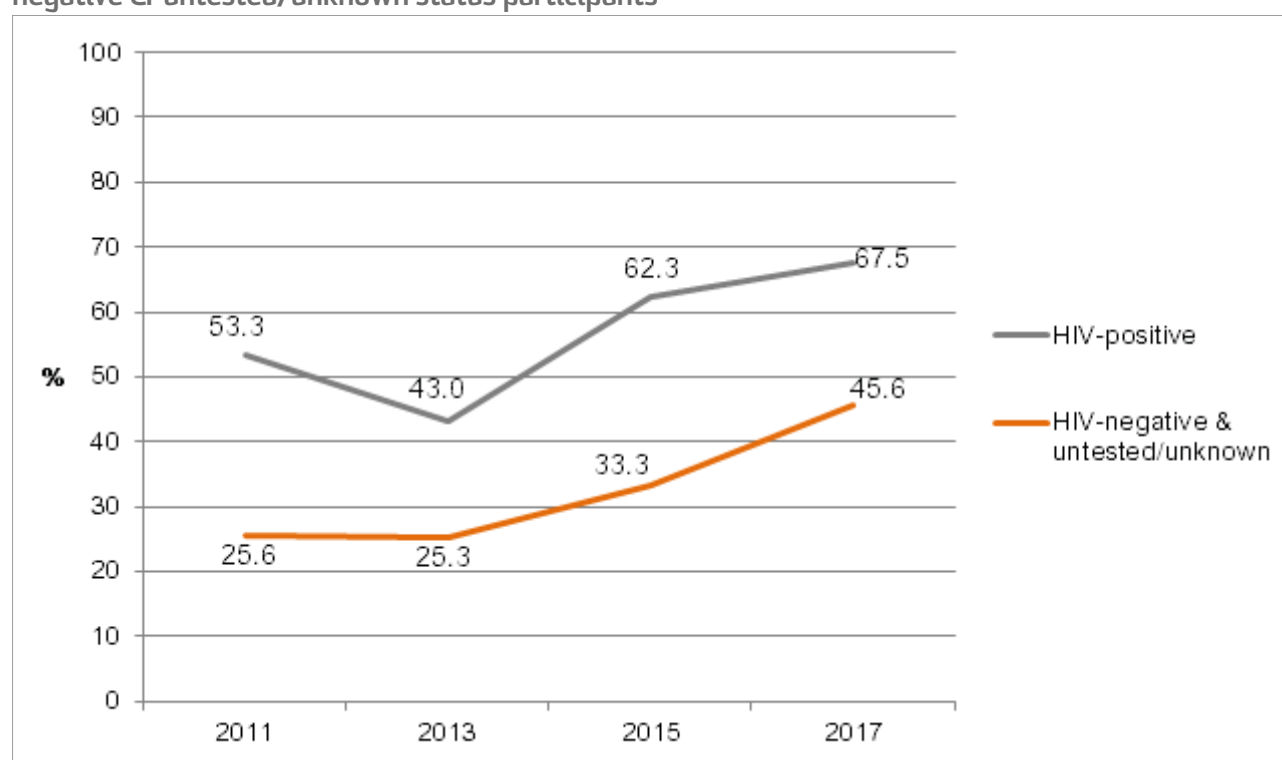
Almost 6 in 10 men ($n=648$, 57.8%) reported having a current regular male partner, and of those 648 men, almost one-third (31.3%) reported that their primary relationship was monogamous and more than half (56.8%) had been in their relationship for at least two years. Among participants with a current regular partner, 82.5% of HIV-negative men and 38.6% of HIV-positive men were in a HIV seroconcordant relationship.

Among all men, half (50.6%) reported any condomless anal intercourse with regular partners (CAIR) in the six months prior to the survey. Among all men, almost half (47.2%) reported any condomless anal intercourse with casual partners (CAIC) in the six months prior to the survey. The level of CAIR in the PrEPARE 2017 sample was lower than that observed in behavioural surveillance samples (the Gay Community Periodic Surveys), while the level of CAIC in PrEPARE was higher than that seen in behavioural surveillance (Holt, Lea, Mao, et al., 2017). HIV-negative/unknown status participants were less likely than HIV-positive participants to report CAIC in the six months prior to the survey (45.6% vs. 67.5%, $p<.001$; see Table 3). There has been an increase between 2015 and 2017 in the proportion of HIV-negative/unknown status participants reporting CAIC ($p<.001$) and there has also been an increase among HIV-positive participants, although this was not statistically significant ($p=.44$; see Figure 1).

Respondents in NSW and VIC were more likely than respondents in other states and territories to report CAIC in the previous six months ($p=.005$; see Appendix 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=1,038)		HIV-positive (n=83)	
	n	%	n	%
Relationships with regular partner				
No regular partner	434	41.8	39	47.0
Monogamous relationship	194	18.7	9	10.8
Non-monogamous relationship	410	39.5	35	42.2
HIV status of regular partner				
No regular partner	434	41.8	39	47.0
HIV-negative	488	47.0	24	28.9
Untested/unknown status	71	6.8	3	3.6
HIV-positive	45	4.3	17	20.5
Anal intercourse with regular partners				
No partner / no intercourse	356	34.3	25	30.1
Consistent condom use	106	10.2	4	4.8
Any anal intercourse without condoms	576	55.5	54	65.1
Anal intercourse with casual partners				
No partner / no intercourse	350	33.7	21	25.3
Consistent condom use	215	20.7	6	7.2
Any anal intercourse without condoms	473	45.6	56	67.5

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

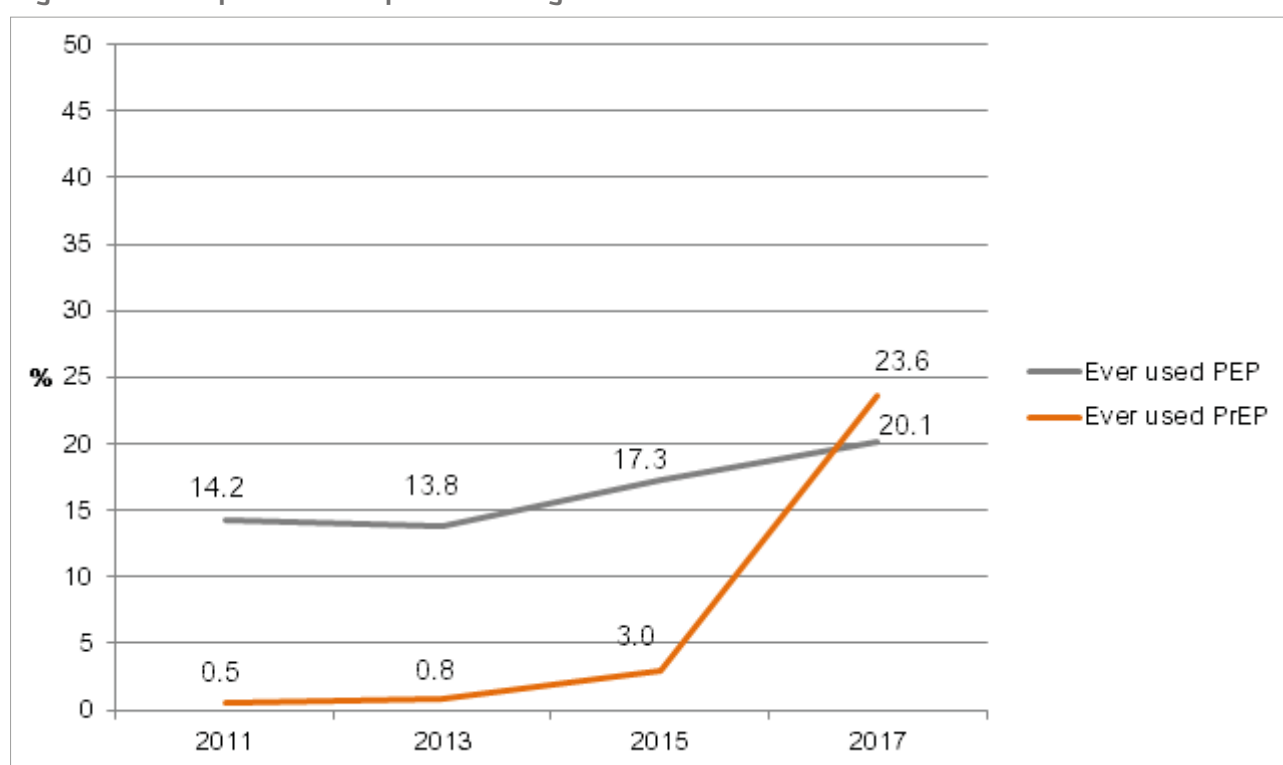
Use of PEP

Twenty per cent of all participants in 2017 (n=225) reported having ever taken post-exposure prophylaxis (PEP) after a suspected exposure to HIV (no significant change from 2015, $p=.09$; see Figure 2). Among these 225 men, most had received PEP once (68.0%) while the remainder had been on PEP two or more times (32.0%).

Use of PrEP

Almost one-quarter of all respondents in 2017 (23.6%; n=265) reported having ever taken pre-exposure prophylaxis (PrEP) to reduce the chance of HIV infection (a significant increase from 3.0% in 2015; $p<.001$) (see Figure 2).

Figure 2 Participants who reported having ever received PEP and PrEP



Excluding HIV-positive men, almost one-quarter of the sample (23.3%; n=242) reported that they were currently taking PrEP at the time of the 2017 survey (a significant increase from 2.1% in 2015; $p<.001$). Almost all of these men (n=238, 98.3%) reported that they were HIV-negative. Among these 242 men, 33.9% reported that they had been taking PrEP for 6 months or less, 38.4% for 7 to 12 months, and 27.7% for more than 12 months. Almost all current PrEP users reported taking it daily (97.5%, n=236). One respondent reported taking it every other day, two respondents reporting taking it before and after sex (event-driven dosing), and three respondents had temporarily stopped taking PrEP. Most respondents who were currently taking PrEP reported accessing it via a research study or demonstration project (82.2%), with smaller groups saying they had purchased it from overseas (33.9%), or got it with a doctor's prescription (25.2%; categories not mutually exclusive). Two respondents reported having accessed PrEP via a HIV-positive person.

Respondents in NSW and VIC were more likely than respondents in other states and

territories to have ever taken PrEP ($p<.001$) and be currently taking PrEP ($p<.001$; see Appendix Table A6).

Characteristics of participants taking PrEP

The mean age of participants taking PrEP at the time of the 2017 survey ($n=242$) was 37.3 years ($SD=9.5$), and 95.0% identified as gay. Most men taking PrEP lived in VIC (40.5%) and NSW (38.0%), with the remainder living in QLD (14.5%) and other states and territories (7.0%). Most had completed tertiary education (55.0%), were in full-time employment (78.9%) and had a current regular partner (61.6%). In the six months prior to the survey, the majority of participants on PrEP reported condomless anal intercourse with regular male partners (73.1%) and casual male partners (81.8%). 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 live in NSW or VIC (78.6% vs. 58.4%; $p<.001$), to have completed tertiary education (55.0% vs. 42.6%; $p=.001$), to be in full-time employment (78.9% vs. 60.0%; $p<.001$), and to have had condomless anal intercourse with regular partners (73.1% vs. 50.1%; $p<.001$) and casual partners in the previous six months (81.8% vs. 34.5%; $p<.001$).

Awareness of PrEP

Five per cent of participants reported having never heard of PrEP before the 2017 survey, 40.6% reported having heard “a little” about PrEP, 30.6% reported having heard “a lot”, and the remainder (23.6%) were either currently taking or had previously taken PrEP. One-quarter of participants who were HIV untested or of unknown status (25.0%) had not heard of PrEP, compared with 3.4% of HIV-negative participants and two HIV-positive participants. The proportion of respondents who had not heard of PrEP in 2017 was significantly lower than in 2015 (5.2% vs. 23.7%; $p<.001$).

Two-thirds of respondents (66.2%) reported that they knew someone who was taking PrEP, a substantial increase from the 2015 survey (28.9%, $p<.001$). In 2017, 38.4% of participants reported that they knew up to five people who were taking PrEP, 9.8% knew between 6 and 10 people, and 17.9% knew more than 10 people taking PrEP. Participants in NSW and VIC were more likely to know someone taking PrEP compared to participants in other states and territories ($p<.001$; see Appendix Table A7).

Among HIV-negative and untested/unknown status participants who had never taken PrEP ($n=773$), 1 in 5 men (19.1%) reported having discussed PrEP with a doctor. Only two participants who were untested for HIV or of unknown status had discussed PrEP with a doctor.

Knowledge about PrEP

All participants, with the exception of those who reported having never heard of PrEP ($n=58$), were asked to respond to 11 true or false questions about their knowledge of PrEP. The responses of participants who had not heard of PrEP were coded as “don’t know” responses for each knowledge item.

The mean number of correct knowledge items identified by participants was 7 out of 11

(SD=3.2) (see Table 4), suggesting relatively good knowledge of PrEP, and an improvement on levels of knowledge in the 2015 survey (Holt, Lea, Kippax, et al., 2016; Lea et al., 2015). The knowledge scores of HIV-positive participants (M=7.5, SD=3.0) and HIV-negative participants (M=7.0, SD=3.0) were higher than those of HIV-untested/unknown status participants (M=3.7, SD=3.2; $p<.001$). Knowledge scores were higher among participants in NSW and VIC compared to participants in other states and territories ($p<.001$; see Appendix Table A8).

More than three-quarters of participants correctly identified that “PrEP’s effectiveness depends on how often you take it” and that “PrEP is [not] effective if you take it on a one-off basis”. However, many participants were not aware that “Australians can import PrEP drugs from overseas for personal use”, that “Only people at high risk of HIV are recommended to take PrEP” and that “PrEP can be more effective than condoms in preventing HIV” (see Table 4).

Table 4 Knowledge about PrEP (n=1,121)

	Correct response	Correct	n
PrEP’s effectiveness depends on how often you take it	True	79.2	16.9
PrEP is effective if you take it on a one-off basis (like a “morning after” pill)	False	78.1	17.1
PrEP is available through research studies in Australia	True	77.3	20.2
Taking PrEP has no side effects	False	64.2	30.8
Being prescribed PrEP involves regular clinical visits	True	62.3	28.4
Doctors can write private prescriptions for PrEP in Australia	True	61.6	28.5
PrEP is available as a subsidised medicine in Australia	False	59.3	28.6
Australians can import PrEP drugs from overseas for personal use	True	59.2	30.5
Only people confirmed as HIV-negative should take PrEP	True	52.7	23.3
Only people at high risk of HIV are recommended to take PrEP	True	52.5	16.0
PrEP can be more effective than condoms in preventing HIV	True	31.8	25.2
Total number of correct items (maximum 11) (M, SD)	-	6.8	3.2

M, mean; SD, standard deviation

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=773). See Appendix Table A9 for state and territory comparisons.

Willingness to use PrEP

In 2017, 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, 36.5% of HIV-negative/unknown status participants were categorised as willing to use PrEP. This represents a significant increase from the 30.0% of HIV-negative/unknown status participants who indicated that they were willing to use PrEP in 2015 ($p<0.001$; see Figure 3). However, in 2017 almost two-thirds (63.5%) of HIV-negative/untested participants remained unwilling to use or neutral about using PrEP.

Among the 335 HIV-negative/unknown status men in 2017 who were categorised as eligible to commence PrEP (according to the criteria in Box 1), 48.7% were categorised as willing to use PrEP.

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.

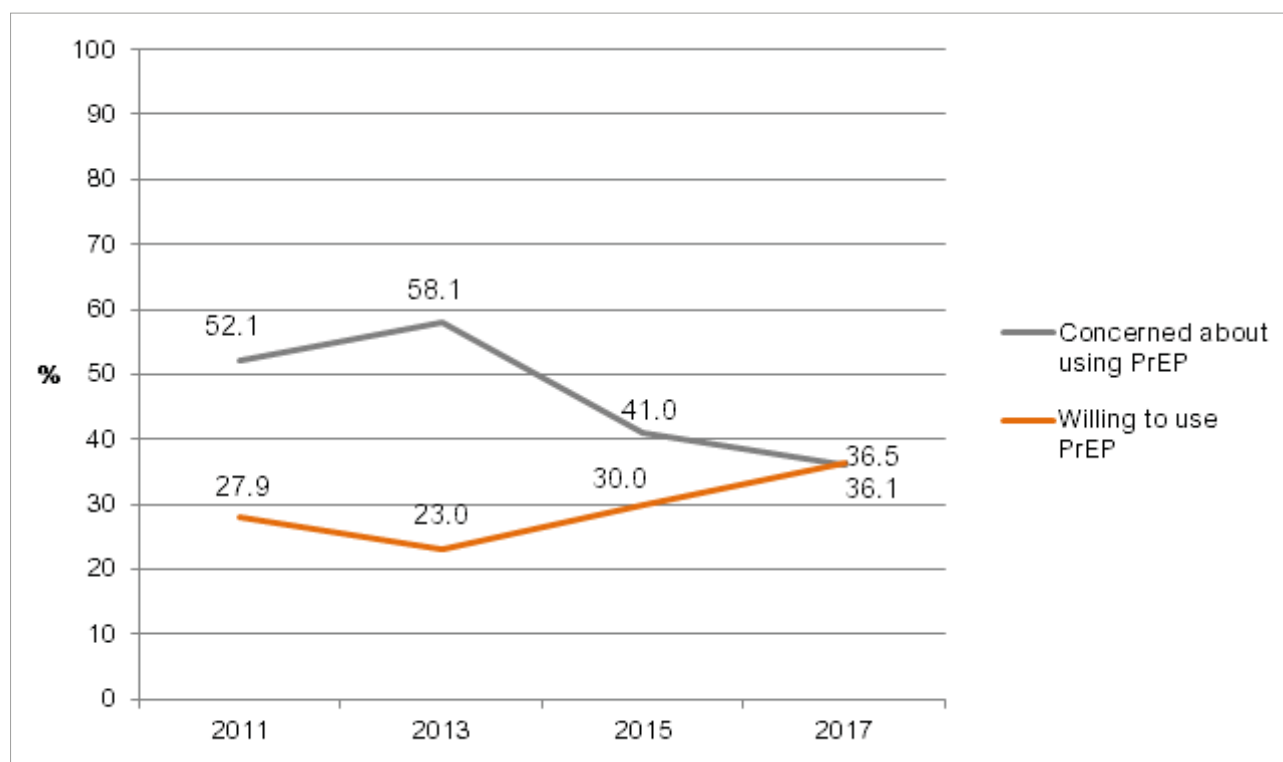
These criteria are an approximation of the PrEP eligibility criteria used to define gay and bisexual men who are at high risk of HIV, as recommended in the Australian PrEP prescribing guidelines (Wright et al., 2017).

Concern about using PrEP

In 2017, the mean score on the *Concern about using PrEP* scale was 3.3 (SD=0.9). Based on a score of ≥ 4 on the scale, 36.1% of HIV-negative and untested/unknown status participants were categorised as concerned about using PrEP, and 63.9% were categorised as unconcerned or neutral about using PrEP. This represents a significant decrease from the 41.0% of participants who were concerned about using PrEP in 2015 ($p=.01$; see Figure 3).

Among the 335 HIV-negative/unknown status men in 2017 who were categorised as eligible to commence PrEP (see Box 1), 28.7% were categorised as concerned about using PrEP.

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



Likelihood of reduced condom use if using PrEP

Among men who were willing to use PrEP ($n=282$), the mean score on the *Likelihood of decreased condom use if using PrEP* scale was 2.8 ($SD=1.1$). Based on a score of ≥ 4 on the scale, 22.3% of these men were categorised as likely to reduce condom use if they were taking PrEP and 77.7% 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 2015 (15.3% in 2015; $p=.07$).

Reduced HIV concern from PrEP

In 2017, a new scale was developed examining concerns about HIV in the era of PrEP among HIV-negative and untested/unknown status participants who had never taken PrEP. The mean score on this scale was 3.1 ($SD=0.9$). Based on a score of ≥ 4 on the scale, 22.8% of HIV-negative and untested/unknown participants were categorised as having reduced concerns about HIV because of PrEP, and 77.2% were categorised as neutral or not having reduced concerns about HIV due to PrEP.

Attitudes towards PrEP among men taking PrEP

This section presents findings from two new scales developed in 2017 that examine the attitudes towards and experiences of PrEP among men who were taking PrEP at the time of the survey ($n=242$).

Sexual confidence and reduced HIV concern from PrEP

The mean score on the *Sexual confidence and reduced HIV concern from PrEP* scale was 4.2 (SD=0.7). Based on a score of ≥ 4 on the scale, 73.6% of participants who were taking PrEP at the time of the 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. There were no significant differences between men in NSW and other states in the proportions of men who reported increased sexual confidence and reduced HIV concerns because of PrEP (NSW, 79.3%; VIC, 68.4%; QLD, 74.3%).

Concerns about PrEP disclosure

The mean score on the *Concerns about PrEP disclosure* scale was 2.2 (SD=1.0). Based on a score of ≥ 4 on the scale, 7.4% 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 92.6% were categorised as unconcerned or neutral about disclosing that they were on PrEP. Comparisons between jurisdictions could not be made due to small cell counts.

Attitudes towards other men taking PrEP

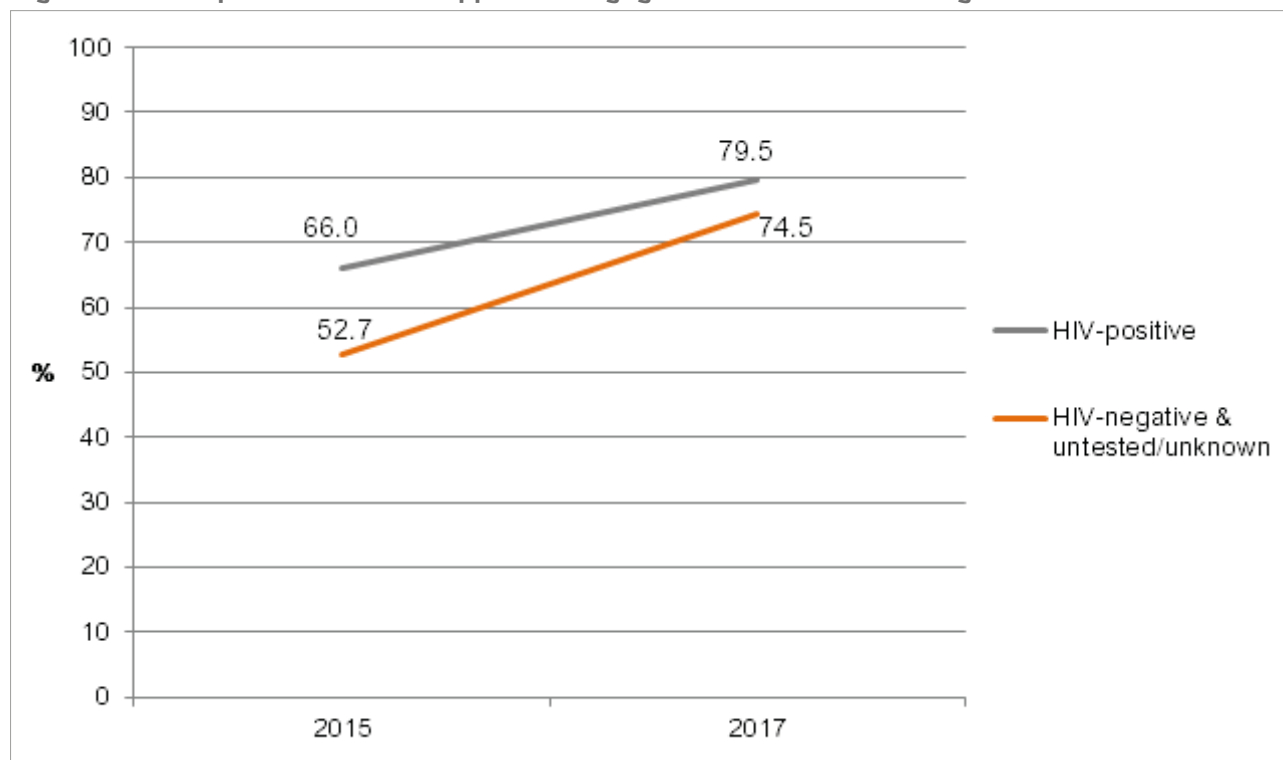
This section examines the attitudes of participants towards GBM taking PrEP, and attitudes towards participants' male sex partners taking PrEP. These questions were completed by all participants except those who were taking PrEP at the time of the survey. In addition, men with HIV-positive regular partners were not included in the *Expect sex partners to use PrEP* scale.

Support for GBM taking PrEP

In 2017, the mean score on the *Support for gay and bisexual men taking PrEP* scale was 4.1 (SD=0.8). Based on a score of ≥ 4 on the scale, 75.0% of participants were categorised as being supportive of gay and bisexual men taking PrEP, and 25.0% were categorised as unsupportive or neutral. There were no differences between HIV-positive participants and HIV-negative and untested/unknown status participants in level of support for GBM taking PrEP (see Figure 4).

Between 2015 and 2017, there was an increase in the proportion of both HIV-positive participants ($p=.04$) and HIV-negative/unknown status participants ($p<.001$) who were supportive of GBM taking PrEP (see Figure 4).

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

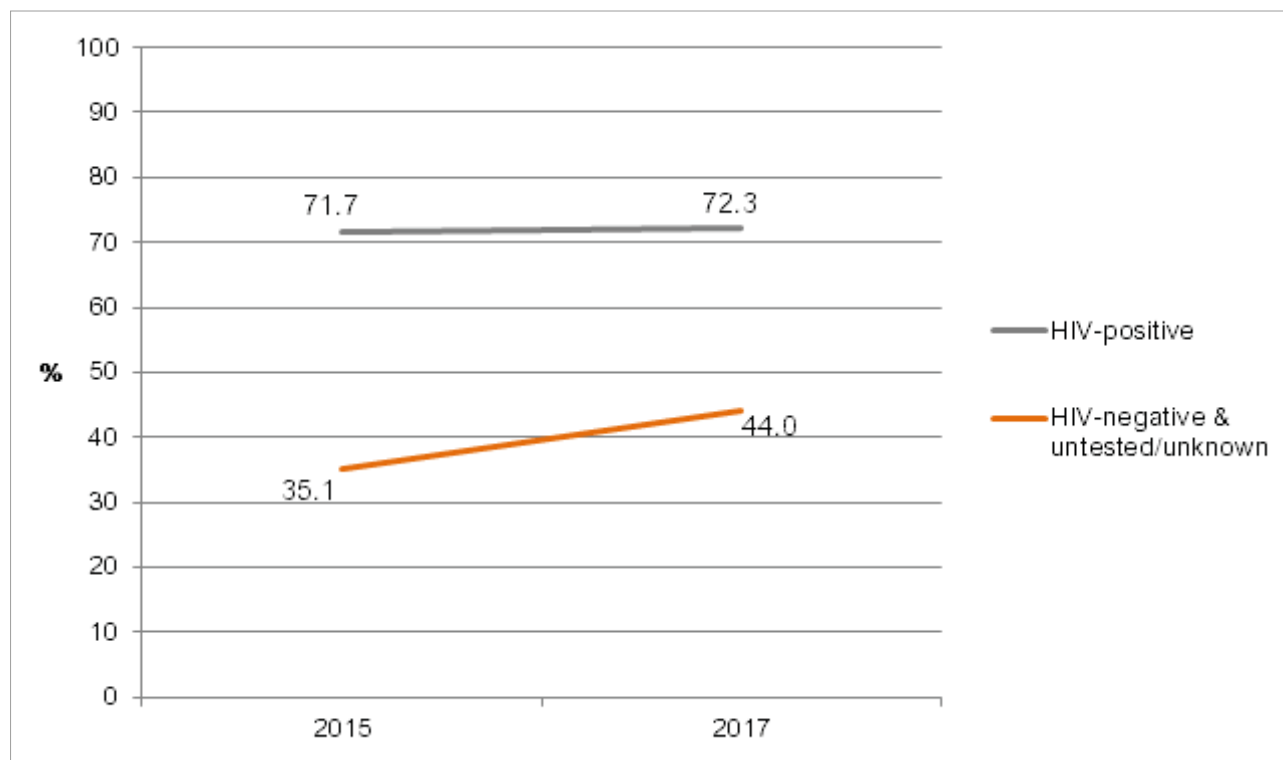


Willingness to have sex with GBM taking PrEP

In 2017, the mean score on the *Willingness to have sex with GBM taking PrEP* scale was 3.6 (SD=0.9). Based on a score of ≥ 4 on the scale, 46.6% of participants were categorised as willing to have sex with GBM taking PrEP, and 53.4% 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 (72.3% vs. 44.0%; $p < .001$).

Between 2015 and 2017, there was 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; $p < .001$; see Figure 5). There was no change in willingness among HIV-positive participants.

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



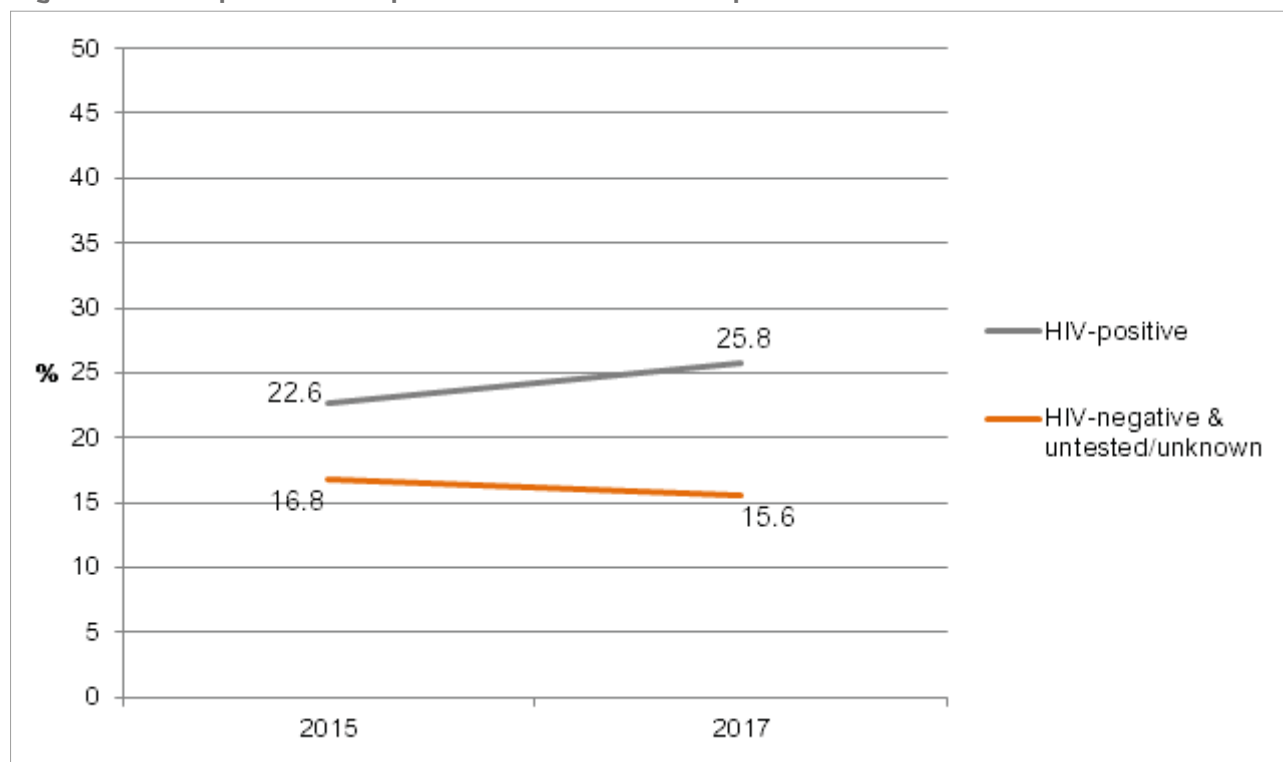
Expectation that sex partners will take PrEP

In 2017, the mean score on the *Expect sex partners to use PrEP* scale was 2.8 (SD=1.0). Based on a score of ≥ 4 on the scale, 16.4% were categorised as expecting that their sex partners use PrEP, and 83.6% were categorised as neutral or not having these expectations. HIV-positive men were more likely than HIV-negative and untested/unknown status participants to expect that sex partners use PrEP (25.8% vs. 15.6%; $p=.03$).

Participants in NSW and QLD were more likely than participants in VIC and other states and territories to be categorised as expecting sex partners to use PrEP ($p=.01$; see Appendix Table A10).

Between 2015 and 2017, there was no change in the proportion of HIV-positive participants ($p=.83$) and HIV-negative/untested participants ($p=.53$) who expected that their sex partners would use PrEP (see Figure 6).

Figure 6 Participants who expected that their male sex partners would use PrEP



Attitudes towards HIV treatment as prevention

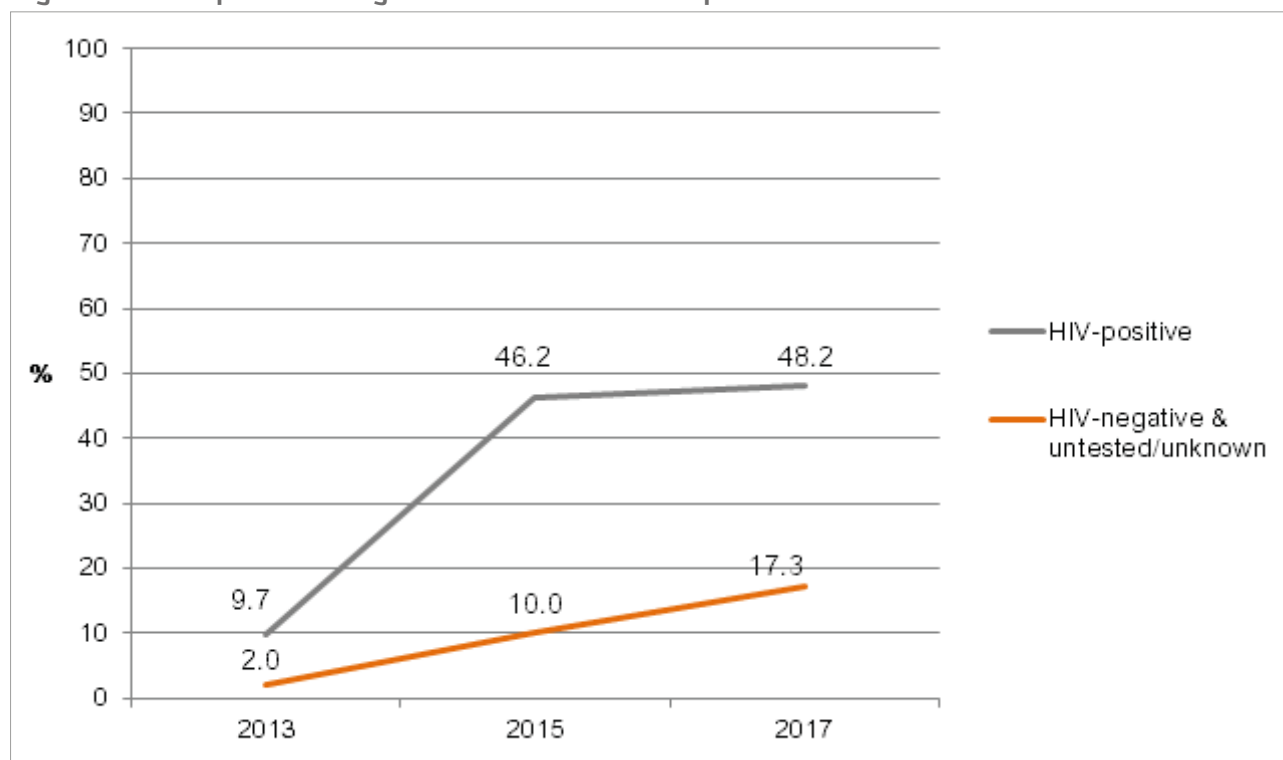
HIV treatment prevents transmission

In 2017, the mean score on the *HIV treatment prevents transmission* scale was 2.9 (SD=0.9) among HIV-negative and untested/unknown status participants, and 3.7 (SD=1.0) among HIV-positive participants in 2017 ($p<.001$). Based on a score of ≥ 4 on the scale, 19.6% of all participants were categorised as believing that HIV treatment prevents transmission (17.3% of HIV-negative and untested/unknown status participants and 48.2% of HIV-positive participants; $p<.001$). In 2015, 13.1% of all participants believed that HIV treatment prevents transmission.

Compared to the 2015 survey, there was a significant increase in belief in TasP among HIV-negative and untested/unknown status participants ($p<.001$; see Figure 7). However, there was no change in belief in TasP among HIV-positive participants between 2015 and 2017 ($p=.77$; see Figure 7). Among HIV-positive men, there was a large increase in belief in TasP between 2013 and 2015, which appears to have stabilised in 2017.

Among HIV-negative and untested/unknown status participants in 2017, a higher proportion of men in NSW and VIC reported a belief in TasP compared to men in other locations ($p<.001$; see Appendix Table A11).

Figure 7 Participants who agreed that HIV treatment prevents transmission



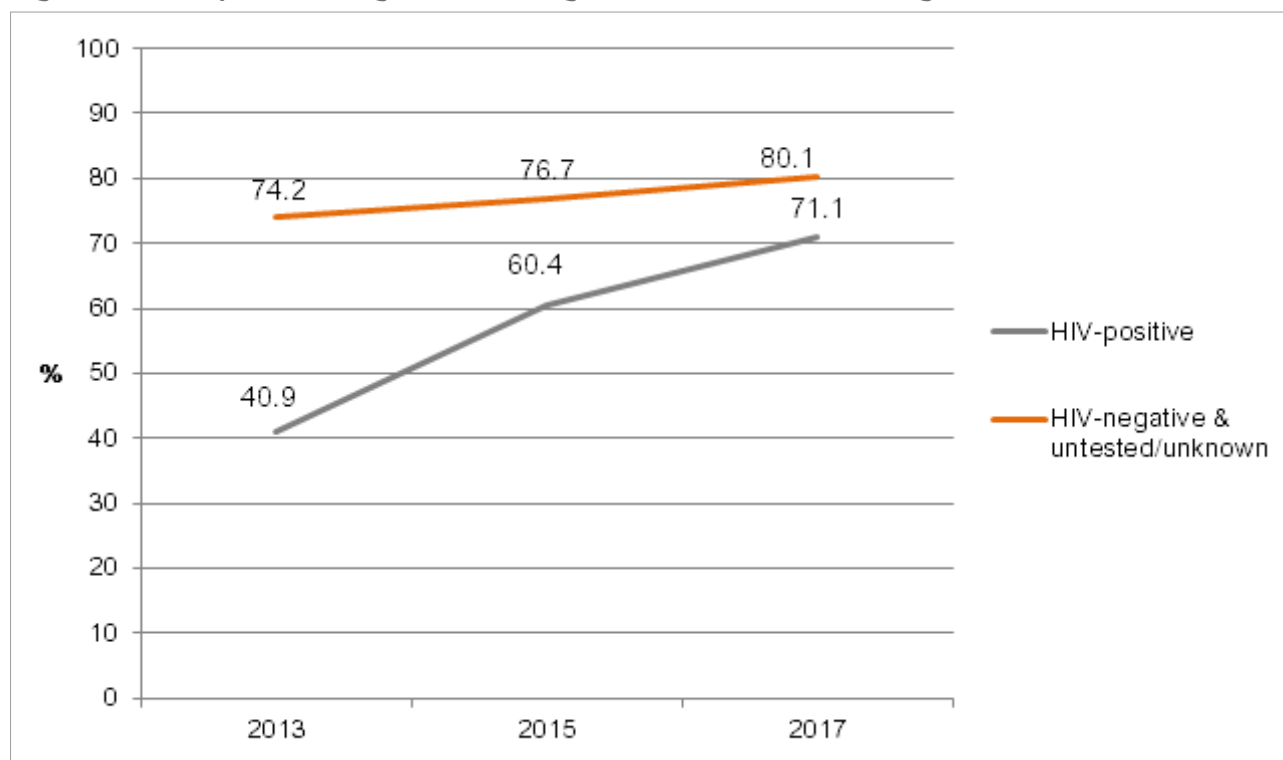
Early HIV treatment is necessary

In 2017, the mean score on the *Early HIV treatment is necessary* scale was 4.4 (SD=0.7) among HIV-negative and untested/unknown status participants, and 4.1 (SD=1.0) among HIV-positive participants ($p<.001$). Based on a score of ≥ 4 on the scale, 79.4% of all participants were classified as agreeing that early HIV treatment is necessary in 2017, a significant increase from 75.3% in 2015 ($p=.001$).

Three-quarters (80.1%) of HIV-negative and untested/unknown status participants and 71.1% of HIV-positive participants were categorised as believing that early HIV treatment is necessary in 2017. This was not a significant change from 2015 for HIV-negative and untested/unknown status participants ($p=.06$) nor HIV-positive participants ($p=.12$; see Figure 8).

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 ($p=.001$). While HIV-positive men remain less enthusiastic about early HIV treatment than HIV-negative/unknown status men, their attitudes to early treatment have become more supportive over time.

Figure 8 Participants that agreed that early HIV treatment is necessary

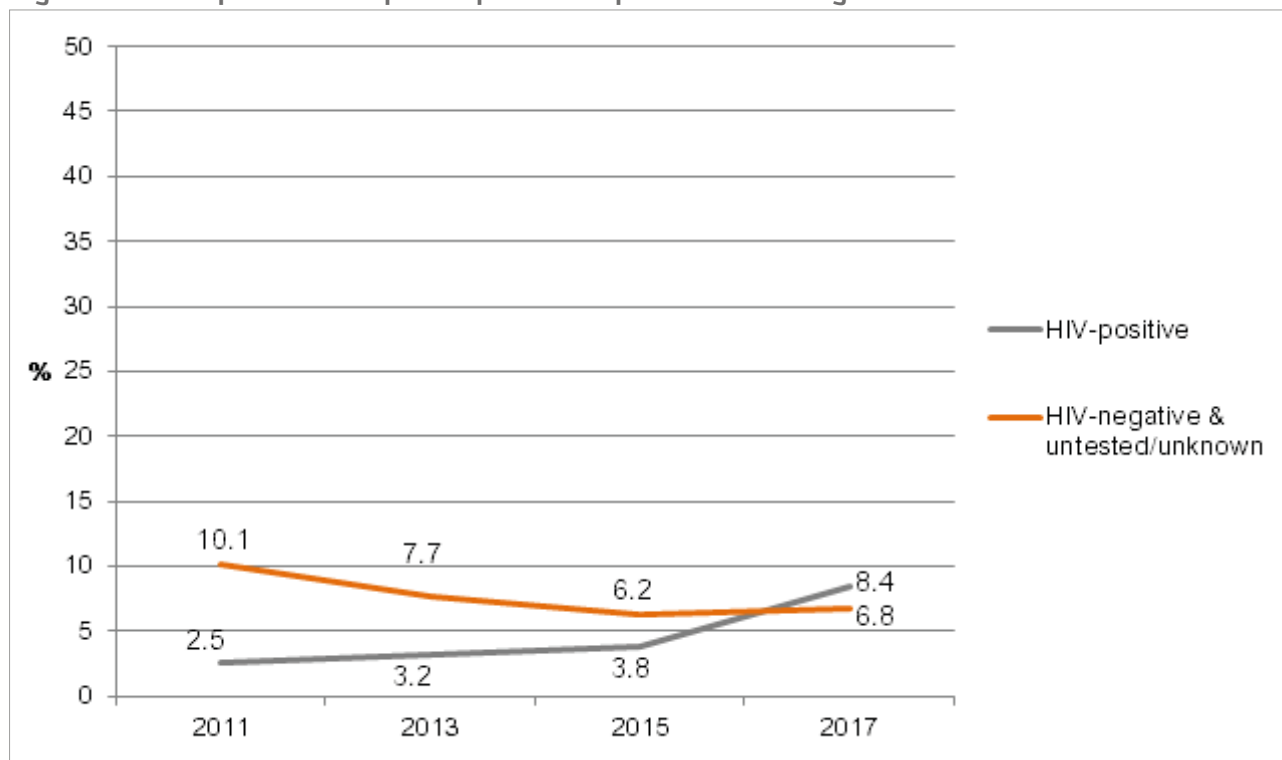


Attitudes towards condoms

Questions about attitudes towards condoms have been asked of all participants since the inception of the survey. 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 but remain confident in using them (discussing them with partners).

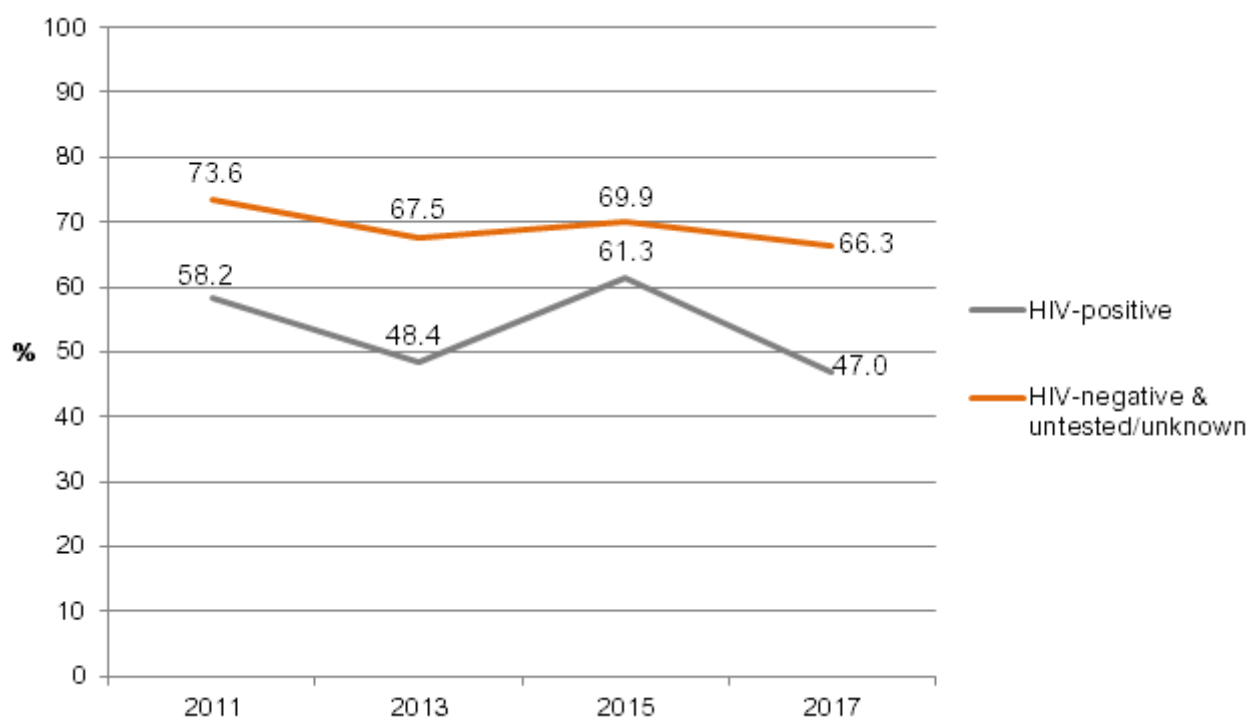
Based on scores of ≥ 4 on the *Personal experience in using condoms* scale, 6.8% of HIV-negative and untested/unknown status participants and 8.4% of HIV-positive participants in 2017 were regarded as having positive experiences of using condoms ($p=.58$). There was no change in the proportion of participants reporting positive experiences of using condoms between 2015 and 2017 (HIV-negative/unknown status men, $p=.29$; HIV-positive men, $p=.17$). However, there was a significant increase from 2.5% in 2011 to 8.4% in 2017 in the proportion of HIV-positive men reporting a positive experience of using condoms ($p=.025$; see Figure 9). There was no significant change between 2011 and 2017 among HIV-negative and untested/unknown status men ($p=.17$).

Figure 9 Participants who reported positive experiences of using condoms



Based on scores of ≥ 4 on the *Confidence in discussing condoms with partners* scale, 66.3% of HIV-negative and untested/unknown status participants and 47.0% of HIV-positive participants in 2017 were categorised as having confidence in discussing condoms with partners ($p < .001$). Between 2011 and 2017, there was no significant overall change over time among HIV-negative and untested/unknown status participants ($p = .49$) or HIV-positive participants ($p = .69$; see Figure 10). However, there was a reduction in the proportion of HIV-positive men reporting confidence in discussing condoms with partners between 2015 and 2017 (from 61.3% to 47.0%; $p = .06$). See Appendix Table A12 for comparisons between states.

Figure 10 Participants that reported confidence in discussing condoms with partners



Perceived effectiveness and acceptability of HIV prevention strategies

In 2017, there were high levels of perceived effectiveness and acceptability for both condoms and PrEP as HIV prevention strategies (see Table 5). There was lower endorsement for the effectiveness and acceptability of sustained HIV treatment/undetectable viral load and for serosorting.

HIV-positive participants were more likely than HIV-negative/untested participants to perceive that serosorting ($M=3.1$ vs. $M=2.8$, $p=.03$), PrEP ($M=4.2$ vs. $M=3.9$, $p=.002$) and sustained HIV treatment/undetectable viral load ($M=4.3$ vs. $M=3.4$, $p<.001$) were effective prevention strategies. HIV-positive men were also more likely than HIV-negative and untested men to perceive serosorting ($M=3.5$ vs. $M=2.9$, $p<.001$) and sustained HIV treatment/undetectable viral load ($M=4.4$ vs. $M=3.2$, $p<.001$) as acceptable strategies. HIV-positive participants were less likely than HIV-negative and untested men to rate condoms as acceptable ($M=3.4$ vs. $M=4.1$, $p<.001$).

Between 2011 and 2017, condoms have consistently been considered by participants to be the most effective and acceptable HIV prevention strategy (see Table 5). However, since 2013, there has been a considerable increase in both the perceived effectiveness and acceptability of PrEP (both $p<.001$). There has also been an increase in the perceived effectiveness of condoms since 2013 ($p<.001$) and a decrease in the perceived effectiveness and acceptability of serosorting (both $p<.001$). See Appendix Table A13 for comparisons between states.

Table 5 Perceived effectiveness and acceptability of HIV prevention strategies

	Perceived effectiveness			Acceptability		
	2013 M (SD)	2015 M (SD)	2017 M (SD)	2013 M (SD)	2015 M (SD)	2017 M (SD)
Condoms	3.9 (1.2)	4.1 (0.7)	4.2 (0.7)	4.1 (1.3)	4.2 (1.1)	4.0 (1.2)
Serosorting	3.0 (1.2)	3.0 (1.2)	2.8 (1.2)	3.2 (1.4)	3.1 (1.4)	2.9 (1.4)
PrEP	3.2 (0.9)	3.6 (0.9)	3.9 (0.9)	3.3 (1.2)	3.7 (1.2)	4.0 (1.2)
Early HIV treatment	3.2 (1.0)	3.5 (1.0)	-	3.5 (1.3)	3.7 (1.3)	-
Sustained HIV treatment / undetectable viral load	-	-	3.5 (1.1)	-	-	3.3 (1.4)

Mean scores range from 1 (not at all effective/acceptable) to 5 (completely effective/acceptable).

Perceived likelihood of acquiring HIV

In 2017, 3.7% 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. In 2017, there was no significant difference between participants taking PrEP and men not taking PrEP in the perceived likelihood of acquiring HIV (2.1% vs. 4.1%; $p=.13$). There was also no change over time in the proportion of men who perceived that they were likely to acquire HIV (3.5% in 2011; $p=.78$).

Alcohol and other drug use

In 2017, most participants (70.1%) reported using recreational drugs (and/or drugs used for sex) in the previous six months (excluding alcohol). This is a higher level of recreational drug use than that seen in Australian behavioural surveillance samples e.g. the Gay Community Periodic Surveys (Hull et al., 2017; Lee et al., 2016; Lee et al., 2017). The most commonly used drugs were amyl nitrite (47.1%), cannabis (34.9%), erectile dysfunction medications (26.9%) and ecstasy (23.1%; see Table 6). More than 1 in 5 participants (21.5%) reported using “party drugs for the purpose of sex” in the previous six months and approximately 1 in 20 participants (4.5%) reported any injecting drug use in the previous six months (similar to the levels seen in the Gay Community Periodic Surveys). Almost one-third of participants (30.4%) reported risky drinking at least weekly in the previous six months and one-quarter of participants (25.4%) at least monthly, 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 6). Most of these comparisons were statistically significant ($p<.05$), with the exception of cocaine, ketamine and speed use ($p>.05$). Participants in NSW and VIC were more likely than participants in other locations to report

use of amyl nitrite ($p=.001$), cocaine ($p<.001$) and GHB ($p<.001$), and to report party drug use for sex ($p=.001$). Participants in NSW were more likely than participants in locations other than VIC to report ecstasy use ($p<.001$) and crystal methamphetamine use ($p=.049$; see Appendix Table A14).

Between 2015 and 2017 there was an increase in the proportion of participants who reported cannabis use (from 30.9% to 34.9%; $p=.009$) and a decrease in the proportion of respondents who reported crystal methamphetamine use (from 15.6% to 12.6%; $p=.007$). There was no change between 2015 and 2017 in the proportions of participants reporting party drug use in sexual contexts or injecting drug use.

Table 6 Alcohol and other drug use in the previous six months

	HIV-negative & untested/ unknown (n=1,038)		HIV-positive (n=83)	
	n	%	n	%
Amyl nitrite	473	45.6	55	66.3
Cannabis	351	33.8	40	48.2
Erectile dysfunction medications (e.g., Viagra®, Cialis®, Levitra®)	257	24.8	45	54.2
Ecstasy	230	22.2	29	34.9
Cocaine	163	15.7	15	18.0
Crystal methamphetamine	121	11.7	20	24.1
Gamma hydroxybutyrate (GHB)	87	8.4	14	16.9
Speed (powder methamphetamine)	67	6.5	9	10.8
Ketamine	47	4.5	6	7.2
Party drug use in sexual contexts	206	19.8	35	42.2
Injecting drug use	39	3.8	12	14.5

Discussion

The 2017 round of the PrEPARE Project survey has revealed changing attitudes to biomedical HIV prevention among Australian gay and bisexual men, in the context of continuing increases in HIV treatment uptake by HIV-positive men, and rapidly increasing levels of PrEP use by HIV-negative men in the eastern states (Hull et al., 2017; Lee et al., 2016; Lee et al., 2017). Since we conducted the 2015 survey, NSW and VIC in particular have implemented large-scale PrEP demonstration projects (EPIC-NSW and PrEPX), and this was reflected in the increase in the proportion of PrEP users in the 2017 round. Nearly a quarter of the 2017 sample were current PrEP users, with the majority residing in NSW and VIC, and there were dramatic increases in awareness and knowledge of PrEP. The level of PrEP use we found in 2017 is among the highest recorded in any sample of Australian gay and bisexual men to date (Hull et al., 2017; Lee et al., 2016; Lee et al., 2017). Underlining the growing salience of PrEP within gay and bisexual men's social networks, the proportion of men who indicated they knew someone who was using PrEP doubled from 29% in 2016 to 66% in 2017.

The increase in awareness, knowledge and use of PrEP in 2017 was accompanied by a variety of changes in community attitudes to PrEP, most of which were positive or supportive of PrEP use in general and PrEP users in particular. Willingness to use PrEP by HIV-negative and untested men increased to the highest level we have recorded so far (37%), while concern about using PrEP (concerns about taking medication and side effects) fell to its lowest level (36%) since we started tracking these indicators (Holt, Lea, Schmidt, et al., 2017). However, we note that even among men who were classified as eligible for PrEP, based on higher risk behaviour (Wright et al., 2017), only half (49%) were willing to use PrEP in 2017. This suggests that there may be challenges in achieving high levels of PrEP coverage in some jurisdictions, and that PrEP is not automatically seen as an acceptable prevention strategy by all gay and bisexual men at risk of HIV.

In 2017, support for other men using PrEP increased (to 75% of the sample), as did willingness to have sex with men using PrEP (to 47%). The majority of PrEP users (74%) in the 2017 survey reported increased sexual confidence and reduced concerns about HIV as a result of PrEP, which aligns with some of the main benefits of PrEP described by the first cohort of PrEP users in Australia and overseas (Grant & Koester, 2016; Haire, Callander, Vaccher, Cook, & Murphy, 2016; Koester et al., 2017; Murphy, 2016). Very few PrEP users in the 2017 survey (7%) were concerned about disclosing their PrEP use to others, which suggests that supportive community attitudes have created a climate in which Australian PrEP users feel comfortable discussing their use of this relatively new HIV prevention strategy.

As with PrEP, attitudes to HIV treatment have become more positive and supportive over

time, although there continues to be greater support for the health benefits of treatment rather than treatment as prevention (TasP), as we have previously found (Holt, Lea, Schmidt, et al., 2016; Lea et al., 2015). The proportion of gay and bisexual men who believed that HIV treatment prevents transmission increased to 20% of the sample in 2017, with almost all of the increase concentrated among HIV-negative and untested men. Belief in TasP among HIV-positive men stabilised at 48% in 2017. It appears that efforts to educate and reassure gay and bisexual men about TasP (through community education campaigns, for example) have had some effect, but the majority of gay and bisexual men remain sceptical about relying on HIV treatment and an undetectable viral load for prevention. In contrast, the majority of gay and bisexual men continue to believe that early HIV treatment is necessary (79% in 2017), and support for early treatment has grown rapidly among HIV-positive men in particular since 2013. This suggests that some of the concerns previously held about early treatment by HIV-positive men, such as having to start treatment before one is ready, have been allayed (Holt, Lea, Schmidt, et al., 2016; Newman et al., 2015).

Considering the longstanding HIV prevention strategy of condoms, we have also observed a number of changes in practice and attitudes over time. As in other studies in Australia and overseas, gay and bisexual men in the sample have become less likely to consistently use condoms over time (Chen, Snowden, McFarland, & Raymond, 2016; Hess, Crepez, Rose, Purcell, & Paz-Bailey, 2017; Holt, Lea, Mao, et al., 2017). In 2017, condoms were still perceived as the most effective HIV prevention strategy by gay and bisexual men in the study, although belief in the effectiveness of PrEP and TasP has increased over time. Condoms have consistently been rated as highly acceptable for HIV prevention in the PrEPARE Project, but it's notable that PrEP was rated as equally acceptable in 2017. The challenge that we have previously identified is that although the majority of gay and bisexual men remain confident in using condoms and discussing them with their partners, very few men report positive experiences in using them (Lea et al., 2015).

We acknowledge a number of limitations of our study design, which should be borne in mind when interpreting our findings. The repeated, cross-sectional design means that we could not assess changes in individuals' practices over time, and the results from each year can be affected by recruitment biases and sampling variation. We acknowledge, in particular, the high proportion of PrEP users recruited in the 2017 survey. We suspect that this is partly the result of the PrEPARE Project's branding being attractive to PrEP users, who may therefore have been overrepresented in the 2017 round, compared with community-based studies (Hull et al., 2017; Lee et al., 2017). However, this does mean that for the first time we have been able to examine the experiences of a national sample of PrEP users in Australia, and we anticipate further work on this topic as PrEP use develops.

Finally, we would like to draw attention to the current divergence across Australia in the rollout and experience of biomedical HIV prevention. Many of the positive changes in awareness, knowledge, use and support for PrEP and TasP that we have observed have been most pronounced in New South Wales and Victoria. Australia's most populous states have arguably invested the most in promoting biomedical HIV prevention to gay and bisexual men and in making PrEP available at scale in the last two years, and this effort is reflected in the attitudes and practices of gay and bisexual men in those jurisdictions. We assume that as other states and territories actively promote PrEP and TasP, the divergence between jurisdictions in attitudes to and the use of biomedical prevention will narrow.

Recommendations

- » Continue to improve gay and bisexual men's knowledge of PrEP, particularly its appropriateness for people at high risk of HIV, access options, and its effectiveness, if taken regularly. This could include discussing the positive experiences of current PrEP users, including increased confidence when having sex and reduced anxiety about HIV.
- » Continue to educate gay and bisexual men about the health and preventative benefits of HIV treatment and sustained viral suppression (undetectable viral load).
- » Continue to support the use of condoms, particularly by gay and bisexual men unprotected by PrEP and TasP.
- » Encourage more consistent access to PrEP and community education about biomedical HIV prevention for gay and bisexual men across Australia.

References

- Chen, Y.-H., Snowden, J. M., McFarland, W., & Raymond, H. F. (2016). Pre-exposure prophylaxis (PrEP) use, seroadaptation, and sexual behavior among men who have sex with men, San Francisco, 2004–2014. *AIDS and Behavior*, *20*(12), 2791-2797. doi:10.1007/s10461-016-1357-2
- Grant, R. M., & Koester, K. A. (2016). What people want from sex and preexposure prophylaxis. *Current Opinion in HIV and AIDS*, *11*(1), 3-9. doi:10.1097/coh.0000000000000216
- Haire, B., Callander, D., Vaccher, S., Cook, T., & Murphy, D. (2016). *What PrEP means for safe sex in Sydney: evolving norms*. Paper presented at the Australasian HIV/AIDS Conference, Adelaide
- Hess, K. L., Crepaz, N., Rose, C., Purcell, D., & Paz-Bailey, G. (2017). Trends in sexual behavior among men who have sex with men (MSM) in high-income countries, 1990–2013: a systematic review. *AIDS and Behavior*, *21*(10), 2811-2834. doi:10.1007/s10461-017-1799-1
- Holt, M., Lea, T., Kippax, S., Kolstee, J., Ellard, J., Velecky, M., . . . de Wit, J. (2016). Awareness and knowledge of HIV pre-exposure prophylaxis among Australian gay and bisexual men: results of a national, online survey. *Sexual Health*, *13*(4), 359-365. doi:10.1071/SH15243
- Holt, M., Lea, T., Mao, L., Zablotska, I., Lee, E., Hull, P., . . . Prestage, G. (2017). Adapting behavioural surveillance to antiretroviral-based HIV prevention: reviewing and anticipating trends in the Australian Gay Community Periodic Surveys. *Sexual Health*, *14*(1), 72-79. doi:10.1071/SH16072
- Holt, M., Lea, T., Schmidt, H. M., Kolstee, J., Ellard, J., Murphy, D., . . . de Wit, J. (2017). Willingness to use and have sex with men taking HIV pre-exposure prophylaxis (PrEP): results of online surveys of Australian gay and bisexual men, 2011-15. *Sexually Transmitted Infections*, *93*(6), 438-444. doi:10.1136/sextrans-2016-052774
- Holt, M., Lea, T., Schmidt, H. M., Murphy, D., Rosengarten, M., Crawford, D., . . . De Wit, J. (2016). Increasing belief in the effectiveness of HIV treatment as prevention: results of repeated, national surveys of Australian gay and bisexual men, 2013-15. *AIDS and Behavior*, *20*(7), 1564-1571. doi:10.1007/s10461-016-1306-0
- Holt, M., Murphy, D. A., Callander, D., Ellard, J., Rosengarten, M., Kippax, S. C., & de Wit, J. B. F. (2012). Willingness to use HIV pre-exposure prophylaxis and the likelihood of decreased condom use are both associated with unprotected anal intercourse and the perceived likelihood of becoming HIV positive among Australian gay and bisexual men.

- Sexually Transmitted Infections*, 88(4), 258-263. doi:10.1136/sextrans-2011-050312
- Hull, P., Mao, L., Lea, T., Lee, E., Kolstee, J., Duck, T., . . . Holt, M. (2017). *Gay Community Periodic Survey: Sydney 2017*. Retrieved from Sydney: <http://doi.org/10.4225/53/59598c5643b4d>
- Koester, K., Amico, R. K., Gilmore, H., Liu, A., McMahan, V., Mayer, K., . . . Grant, R. (2017). Risk, safety and sex among male PrEP users: time for a new understanding. *Culture, Health and Sexuality*, Advance online publication. doi:10.1080/13691058.2017.1310927
- Lea, T., Murphy, D., Rosengarten, M., Kippax, S., de Wit, J., Schmidt, H. M., . . . Holt, M. (2015). *Gay men's attitudes to biomedical HIV prevention: Key findings from the PrEPARE Project 2015*. Sydney: Centre for Social Research in Health, UNSW Australia.
- Lee, E., Mao, L., Johns, L., Adair, A., Williams, G., Scott, M., . . . Holt, M. (2016). *Gay Community Periodic Survey: Queensland 2016*. Retrieved from Sydney: <http://doi.org/10.4225/53/588688358b8a9>
- Lee, E., Mao, L., Lea, T., McKenzie, T., Batrouney, C., Allan, B., . . . Holt, M. (2017). *Gay Community Periodic Survey: Melbourne 2017*. Retrieved from Sydney: <https://dx.doi.org/10.4225/53/597145d722292>
- Murphy, D. (2016). Early experience of PrEP in Australia. In L. Mao, P. Adam, C. Treloar, & J. de Wit (Eds.), *Annual Report of Trends in Behaviour: HIV/AIDS, hepatitis and sexually transmissible infections in Australia 2016* (pp. 27-28). Sydney: UNSW Australia.
- National Health and Medical Research Council. (2009). *Australian Guidelines to Reduce Health Risks from Drinking Alcohol*. Retrieved from Canberra: <https://www.nhmrc.gov.au/health-topics/alcohol-guidelines>
- Newman, C. E., de Wit, J., Persson, A., Holt, M., Slavin, S., Kidd, M. R., . . . Mao, L. (2015). Understanding concerns about treatment-as-prevention among people with HIV who are not using antiretroviral therapy. *AIDS and Behavior*, 19(5), 821-831. doi:10.1007/s10461-014-0959-9
- Wright, E., Grulich, A., Roy, K., Boyd, M., Cornelisse, V., Russell, D., . . . Zablotska, I. (2017). Australasian Society for HIV, Viral Hepatitis and Sexual Health Medicine HIV pre-exposure prophylaxis: clinical guidelines. *Journal of Virus Eradication*, 3(3), 168-184.
- Zablotska, I. B., Frankland, A., Holt, M., de Wit, J., Brown, G., Maycock, B., . . . Prestage, G. (2014). Methodological challenges in collecting social and behavioural data regarding the HIV epidemic among gay and other men who have sex with men in Australia. *PLoS ONE*, 9(11), e113167. doi:10.1371/journal.pone.0113167

Appendix

Table A1 Demographic characteristics (%)

	All (N=1,121)	NSW (n=347)	VIC (n=365)	QLD (n=189)
Age (M, SD)	36.9 (12.2)	38.4 (12.3)	36.8 (11.4)	37.1 (13.7)
Sexual identity				
Gay	95.1	95.7	95.1	97.4
Bisexual / Other	4.9	4.3	4.9	2.6
HIV status				
HIV-negative	84.0	85.3	86.6	81.5
HIV-positive	7.4	8.1	7.7	7.9
Untested / Unknown status	8.6	6.6	5.8	10.6
Country of birth				
Australia	80.0	76.4	79.5	86.2
Overseas	20.0	23.6	20.5	13.8
Aboriginal and/or Torres Strait Islander				
Yes	2.8	4.0	0.3	3.2
No	97.2	96.0	99.7	96.8
Highest level of education				
Up to year 12	30.3	24.5	29.3	33.9
Trade certificate	24.0	22.5	27.1	23.3
Undergraduate degree	26.7	30.3	23.8	28.6
Postgraduate degree	19.0	22.8	19.7	14.3
Employment status				
Full-time	64.0	70.9	63.8	54.0
Part-time	11.2	8.4	11.5	12.7
Student	10.6	10.4	9.0	10.6
Unemployed/retired/other	14.2	10.4	15.6	22.7

	All (N=1,121)	NSW (n=347)	VIC (n=365)	QLD (n=189)
Residential location				
Capital city	70.8	70.9	75.6	49.2
Other city	11.5	10.1	9.0	23.8
Regional centre/town	14.1	15.6	11.8	24.3
Rural or remote area	3.6	3.5	3.6	2.7

Table A2 HIV testing and status (%)

	All (N=1,121)	NSW (n=347)	VIC (n=365)	QLD (n=189)
Ever tested				
HIV-negative	92.5	94.2	94.8	90.5
Non-HIV-positive participants				
Tested in past 12 months	73.8	78.7	76.9	72.4
HIV test result				
HIV-positive	7.4	8.1	7.7	7.9
HIV-negative	84.0	85.3	86.6	81.5
Untested / Unknown status	8.6	6.6	5.8	10.6

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

	All (N=83)	NSW (n=28)	VIC (n=28)	QLD (n=15)
Currently on antiretroviral treatment	94.0	96.4	96.4	86.7
Undetectable viral load	92.8	92.9	100.0	86.7

Table A4 STI testing and diagnosis and HCV testing (%)

	All (N=1,121)	NSW (n=347)	VIC (n=365)	QLD (n=189)
STI testing				
Ever	89.1	93.1	91.2	84.7
Past 12 months	72.4	78.7	74.5	68.3
STI diagnosis				
Past 12 months	24.5	29.1	26.8	23.3
HCV testing				
Ever	78.8	80.1	79.7	78.8

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 [^]
	All (N=1,038)	NSW (n=319)	VIC (n=337)	QLD (n=174)	All (N=83)
Relationships with regular partner					
No regular partner	41.8	42.3	43.9	36.2	47.0
Monogamous relationship	18.7	16.3	17.5	18.4	10.8
Non-monogamous relationship	39.5	41.4	38.6	45.4	42.2
HIV status of regular partner					
No regular partner	41.8	42.3	43.9	36.2	47.0
HIV-negative	47.0	44.5	48.1	50.6	28.9
Untested / Unknown status	6.8	7.5	4.7	7.5	3.6
HIV-positive	4.3	5.6	3.3	5.7	20.5
Anal intercourse with regular partners					
No partner / no intercourse	34.3	32.3	35.0	35.6	30.1
Consistent condom use	10.2	9.4	10.4	8.6	4.8
Any anal intercourse without condoms	55.5	58.3	54.6	55.7	65.1
Anal intercourse with casual partners					
No partner / no intercourse	33.7	27.9	32.3	39.1	25.3
Consistent condom use	20.7	22.3	18.7	20.7	7.2
Any anal intercourse without condoms	45.6	49.8	49.0	40.2	67.5

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

Table A6 Use of PEP and PrEP (%)

	All	NSW	VIC	QLD
All participants	(N=1,121)	(n=347)	(n=365)	(n=189)
Ever taken PEP	20.1	20.7	23.3	16.4
Ever taken PrEP	23.6	28.5	28.8	19.6
HIV-negative and untested/ unknown participants	(N=1,038)	(n=319)	(n=337)	(n=174)
Currently taking PrEP	23.3	28.8	29.1	20.1

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

	All (N=773)	NSW (n=220)	VIC (n=232)	QLD (n=137)
Never heard of PrEP	7.2	3.6	7.3	9.5
Know at least one person who is taking PrEP	57.6	65.0	59.1	53.3
Have discussed PrEP with a doctor	19.1	19.5	19.0	23.4

Table A8 Knowledge about PrEP (%)

	Correct response	All (N=1,121)	NSW (n=347)	VIC (n=365)	QLD (n=189)
PrEP's effectiveness depends on how often you take it	True	79.2	83.9	81.6	75.1
PrEP is effective if you take it on a one-off basis (like a "morning after" pill)	False	78.1	83.9	79.7	70.4
PrEP is available through research studies in Australia	True	77.3	82.7	81.6	69.8
Taking PrEP has no side effects	False	64.2	65.7	67.7	64.6
Being prescribed PrEP involves regular clinical visits	True	62.3	68.3	65.8	60.3
Doctors can write private prescriptions for PrEP in Australia	True	61.6	63.4	64.4	59.8
PrEP is available as a subsidised medicine in Australia	False	59.3	62.8	64.1	48.7
Australians can import PrEP drugs from overseas for personal use	True	59.2	62.0	64.1	49.2
Only people confirmed as HIV-negative should take PrEP	True	52.7	59.4	57.5	47.1
Only people at high risk of HIV are recommended to take PrEP	True	52.5	62.0	50.7	44.4
PrEP can be more effective than condoms in preventing HIV	True	31.8	38.0	36.7	24.9
Total number of correct items (maximum 11) M (SD)	-	6.8 (3.2)	7.3 (2.9)	7.1 (3.0)	6.1 (3.4)

M, mean; SD, standard deviation

Table A9 Attitudes towards PrEP among HIV-negative and untested/unknown participants who have never taken PrEP (%)

Scale score ≥ 4	All (N=773)	NSW (n=220)	VIC (n=232)	QLD (n=137)
Willing to use PrEP	36.5	30.5	38.8	34.3
Concerned about using PrEP	36.1	42.3	36.6	33.6
Reduced HIV concern from PrEP	22.8	19.5	24.1	24.8
Men willing to use PrEP	(N=282)	(n=67)	(n=90)	(n=47)
Likely to reduce condom use if using PrEP	22.3	25.4	22.2	25.5

Table A10 Attitudes towards GBM taking PrEP among men not currently taking PrEP (%)

Scale score ≥ 4	All	NSW	VIC	QLD
HIV-negative and untested/unknown participants	(N=796)	(n=227)	(n=239)	(n=139)
Support GBM taking PrEP	74.5	72.2	77.4	74.1
Willing to have sex with GBM taking PrEP	44.0	43.6	47.3	40.3
	(N=767)	(n=215)	(n=233)	(n=133)
Expect partners to take PrEP ^a	15.6	18.1	11.6	19.5
HIV-positive participants	(N=83)	(n=28)	(n=28)	(n=15)
Support GBM taking PrEP	79.5	82.1	85.7	80.0
Willing to have sex with GBM taking PrEP	72.3	78.6	78.6	60.0
	(N=66)	(n=22)	(n=23)[^]	(n=11)[^]
Expect partners to take PrEP ^a	25.8	36.4	-	-

^aExcludes participants with HIV-positive regular partners.

[^]Some findings cannot be reported due to small cell counts.

Table A11 Attitudes towards HIV treatment as prevention (%)

Scale score ≥ 4	All	NSW	VIC	QLD
HIV-negative and untested/unknown participants	(N=1,038)	(n=319)	(n=337)	(n=174)
HIV treatment prevents transmission	17.3	20.7	22.3	9.2
Early HIV treatment is necessary	80.1	77.1	82.5	82.8
HIV-positive participants	(N=83)	(n=28)	(n=28)	(n=15)
HIV treatment prevents transmission	48.2	50.0	53.6	46.7
Early HIV treatment is necessary	71.1	75.0	78.6	46.7

Table A12 Attitudes towards condoms (%)

Scale score ≥ 4	All	NSW	VIC	QLD
HIV-negative and untested/unknown participants	(N=1,038)	(n=319)	(n=337)	(n=174)
Positive experience in using condoms	6.8	6.9	6.2	7.5
Confident discussing condoms with partners	66.3	65.2	67.7	66.1
HIV-positive participants	(N=83)	(n=28)^	(n=28)^	(n=15)^
Positive experience in using condoms	8.4	-	-	-
Confident discussing condoms with partners	47.0	53.6	53.6	-

^Some findings cannot be reported due to small cell counts.

Table A13 Perceived effectiveness and acceptability of HIV prevention strategies

	Perceived effectiveness				Acceptability			
	All M (SD)	NSW M (SD)	VIC M (SD)	QLD M (SD)	All M (SD)	NSW M (SD)	VIC M (SD)	QLD M (SD)
Condoms	4.2 (0.7)	4.2 (0.7)	4.2 (0.7)	4.2 (0.7)	4.0 (1.2)	4.0 (1.2)	4.0 (1.3)	4.0 (1.2)
Serosorting	2.8 (1.2)	2.7 (1.2)	2.8 (1.2)	2.9 (1.2)	2.9 (1.4)	2.8 (1.3)	3.0 (1.4)	3.0 (1.3)
PrEP	3.9 (0.9)	4.0 (0.9)	4.0 (0.9)	3.8 (1.0)	4.0 (1.2)	4.0 (1.2)	4.1 (1.1)	3.8 (1.3)
Sustained HIV treatment / undetectable viral load	3.5 (1.1)	3.6 (1.1)	3.5 (1.1)	3.3 (1.1)	3.3 (1.4)	3.3 (1.4)	3.3 (1.3)	3.2 (1.4)

M, mean; SD, standard deviation.

Mean scores range from 1 (not at all effective/acceptable) to 5 (completely effective/acceptable).

Table A14 Alcohol and other drug use in the previous six months (%)

	All (N=1,121)	NSW (n=347)	VIC (n=365)	QLD (n=189)
Amyl nitrite	47.1	51.6	51.2	42.9
Cannabis	34.9	36.9	34.2	36.5
Erectile dysfunction medications	26.9	32.9	26.3	29.1
Ecstasy	23.1	29.7	24.4	16.4
Cocaine	15.9	22.2	18.9	7.9
Crystal methamphetamine	12.6	16.4	12.1	9.0
Gamma hydroxybutyrate (GHB)	9.0	15.6	9.9	3.2
Speed (powder methamphetamine)	6.8	5.8	9.3	5.3
Ketamine	4.7	6.1	7.1	(n=2)
Party drug use in sexual contexts	21.5	26.2	24.1	13.8
Injecting drug use	4.5	5.8	4.1	4.8