


Increasing Belief in the Effectiveness of HIV Treatment as Prevention: Results of Repeated, National Surveys of Australian Gay and Bisexual Men, 2013–15

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Abstract We surveyed Australian gay and bisexual men, assessing belief in HIV treatment as prevention (TasP) and support for early treatment. We identified the characteristics of participants who believed in TasP and supported early treatment using multivariate logistic regression. In 2013, 1316 men participated; 1251 participated in 2015. Belief in TasP increased from 2.6 % in 2013 to 13.1 % in 2015 ($p < 0.001$). The increase was most noticeable among HIV-positive men (from 9.7 % to 46.2 %). Support for early treatment increased from 71.8 % to 75.3 % ($p = 0.02$). Belief in TasP was associated with being HIV-positive, having a tertiary education, having recent condomless anal intercourse with casual male partners, and ever having taken post-exposure prophylaxis. Support for early HIV treatment was associated with being younger, living in New South Wales and being in paid employment. We recommend continued monitoring of the growing gap in belief about TasP between HIV-positive men and HIV-negative/untested men.

Resumen Encuestamos a hombres australianos gay y bisexuales, evaluando la creencia en el tratamiento como prevención del VIH (TaSP – por sus siglas en inglés) y apoyo al tratamiento temprano. Se identificaron las características de los participantes que creyeron en (TasP) y tratamiento temprano mediante regresión logística multivariante. En el 2013, participaron 1.316 hombres; en el 2015 participaron 1.251. La creencia en (TasP) aumentó de 2.6 % en el 2013 a 13.1 % en el 2015 ($p < 0.001$). El aumento fue más notable entre los hombres VIH-positivos (de 9.7 % a 46.2 %). Apoyo al tratamiento temprano aumentó de 71.8 % a 75.3 % ($p = 0.02$). La creencia en TasP se asoció con ser VIH-positivo, con tener una educación terciaria, con tener coito anal recientemente sin condón con parejas casuales y con haber tomado, por lo menos alguna vez, la profilaxis posexposición. El apoyo al tratamiento temprano del VIH se asoció con ser más joven, con vivir en Nueva Gales del Sur y con tener empleo remunerado. Se recomienda el monitoreo continuo de la creciente brecha acerca de la creencia en TasP entre hombres VIH-positivos y VIH-negativo/no comprobado.

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Introduction

HIV treatment as prevention (TasP) is a population health strategy that involves offering HIV treatment as early as possible to people living with HIV to prevent disease progression and to reduce the chance of onward transmission. The strategy was developed and advocated by researchers after clinical trial results showed that early

antiretroviral treatment dramatically reduced HIV transmission within heterosexual couples where one partner was HIV-positive [1, 2]. Interim findings suggest that HIV treatment is also highly effective in preventing transmission within gay male couples where one partner is HIV-positive [3]. International organisations such as the World Health Organization and community-based HIV organisations have subsequently endorsed the wider use of HIV treatment to improve the health of people living with HIV and to prevent onward transmission, as long as treatment remains voluntary and informed [4–6].

Despite the increased policy emphasis on promoting TasP, there has been remarkably little analysis of the acceptability of HIV treatment as prevention to affected communities [7, 8]. By acceptability, we mean research into whether communities have heard about the strategies (awareness), what they understand or know about them (knowledge), and whether they are willing to use the strategies or support others doing so. British research conducted in 2011–12 found that over half of treatment-naïve HIV-positive people (primarily gay men) were in favour of the early initiation of treatment for HIV prevention [9]. National surveys of Australian gay and bisexual men conducted during 2011–13 found majority support for the early initiation of HIV treatment but very low (<3 %) levels of belief in the effectiveness of TasP [10]. HIV-positive men and their regular partners were more likely to believe that HIV treatment prevented transmission than HIV-negative and untested men. More recent research with gay and bisexual men in Vancouver found that over half believed that HIV treatment reduced the risk of transmission, but knowledge of TasP was inconsistent [11]. Australian qualitative research has found that HIV-positive people not on treatment expressed a range of reservations about TasP [12], including the idea that TasP undermines an individual's right to decide when to start treatment, that the needs of the population are being put before those of individual patients, and that TasP may encourage greater levels of risk-taking. In contrast, serodiscordant couples (where one partner is HIV-positive) were generally relieved at the trial evidence in favour of TasP [13].

In Australia, the benefits of early HIV treatment and having an undetectable viral load have been actively promoted to gay and bisexual men since 2012, most notably in the *Ending HIV* social marketing campaign developed by the community organisation ACON (first released in New South Wales, then other jurisdictions; see <http://endinghiv.org.au>). The tagline of the campaign is 'Test More + Treat Early + Stay Safe = Ending HIV'. These education activities reflect and support state and national HIV strategies that encourage earlier diagnosis, treatment and the use of HIV treatment for prevention [14–16].

Australian prescribing guidelines were changed at the beginning of 2014, recommending HIV treatment for all HIV-positive people, regardless of CD4 cell count [17]. Australian clinicians are increasingly willing to prescribe HIV treatment early i.e. soon after diagnosis and before a patient's CD4 cell count drops below 500 [18]. We have surveyed Australian gay and bisexual men every 2 years since 2011, assessing attitudes to different HIV prevention strategies, including TasP [10, 19]. This analysis assesses whether attitudes have changed over time and identifies the characteristics of gay and bisexual men who support TasP and early treatment.

Method

Participants and Procedures

Data were collected as part of the PrEPARE Project, a study of Australian gay and bisexual men's attitudes to biomedical HIV prevention technologies, including TasP [10, 19]. The UNSW Human Research Ethics Committee approved the study design. National online surveys of gay and bisexual men were conducted in April–May 2011, June–July 2013 and April–May 2015 using NETQ survey software (NetQuestionnaires Nederland BV). The survey was advertised on Facebook (using paid advertising) and email lists aimed at gay and bisexual men. Consenting participants from the 2013 survey were invited by email to participate in the 2015 survey. Potential participants were directed to the survey website, <http://prepareproject.csrh.org>, which explained the purpose of the study and provided access to the online questionnaire. Participants were eligible if they were at least 18 years old, male, lived in Australia and were gay or bisexual. No incentive was offered for participation.

Measures

Wherever possible, the same questions were used in each survey round. We included questions about demographics, sexual practices with men, relationships, HIV testing and HIV status, adapted from behavioural surveillance questionnaires [20]. Due to small sample sizes in some jurisdictions, the state/territory variable was simplified in multivariate analyses to four categories: New South Wales, Victoria, Queensland and other states/territories. A 9-item scale developed in the 2011 survey measured personal experience in using condoms (Cronbach's $\alpha = 0.88$ – 0.90 , 2011–15). The scale score was a mean of the items within the scale (from 1 to 5); men with a score of ≥ 4 were classified as having a positive experience in using condoms [21].

The primary outcomes for this analysis were two previously published scales identified after the 2013 survey [10], ‘HIV treatment prevents transmission’ (3 items, Cronbach’s $\alpha = 0.73$ in 2015) and ‘early HIV treatment is necessary’ (3 items, $\alpha = 0.67$ in 2015). Scale items were Likert-type attitudinal items (each scored from 1 = strongly disagree to 5 = strongly agree). Scale scores were a mean of the items within the scale (from 1 to 5), with a score of ≥ 4 indicating positive agreement e.g. participants who scored ≥ 4 on the HIV treatment prevents transmission scale were classified as agreeing that HIV treatment prevents transmission. This was the scoring method used in our previous publication about attitudes to TasP [10].

Data analysis

Before analysis, the database was inspected manually for duplicate or suspicious entries (those with identical IP addresses, responses or email addresses). Stata Version 13.0 (StataCorp LP, USA) was used for data analysis. Statistical significance was set at $p < 0.05$. Only data from the 2013 and 2015 survey rounds were included in this analysis, as the primary outcome measures (scales) were not included in the 2011 survey. The characteristics of the 2013 and 2015 samples were compared using χ^2 tests and t tests to identify potentially confounding factors, focusing on demographic criteria (e.g. age, education level) and variables we have previously found to be associated with attitudes to TasP e.g. participant’s HIV status, partner’s HIV status, sexual practices in the previous 6 months, previous use of HIV post-exposure prophylaxis (PEP) [10].

To assess change over time, multivariate logistic regression was used to compare the proportions of men in 2013 and 2015 who agreed that HIV treatment prevents transmission and that early HIV treatment is necessary, controlling for potentially confounding factors (social and behavioural differences between the 2013 and 2015 samples). Multivariate logistic regression was also used to identify the characteristics of men in 2015 who agreed that HIV treatment prevents transmission and the characteristics of men who agreed that early HIV treatment is necessary. To build the multivariate models, we initially identified bivariate associations with the scale scores using logistic regression, reporting unadjusted odds ratios. For these analyses, we initially included demographic variables, sexual practice and relationship variables, HIV status and sexual health testing and variables we have previously found to be associated with attitudes to HIV treatments, such as the previous use of PEP [10, 19]. All variables with a statistically significant bivariate relationship with the scales were block entered into the multivariate models and adjusted odds ratios were calculated.

Results

In 2013, the online survey was completed by 1316 men, of whom 966 reported that they were HIV-negative, 257 were untested or of unknown HIV status and 93 were HIV-positive. In 2015, the online survey was completed by 1251 men, of whom 990 were HIV-negative, 155 were untested or of unknown HIV status and 106 were HIV-positive. No duplicate or suspicious entries were found. Sample characteristics are shown in Table 1.

Compared to the 2013 sample, men in the 2015 sample were older, more likely to identify as gay, be born in Australia, live outside of a capital city, to have had anal intercourse with regular or casual partners in the previous 6 months, and to have ever used PEP (see Table 1). Across both survey years, previous PEP use was more likely to be reported by HIV-negative men (18.7 %), compared with HIV-positive (14.1 %) and untested/unknown status men (1.2 %; $p < 0.001$). Men in the 2015 sample were less likely have completed any tertiary education or be a student and more likely to be unemployed or retired. We controlled for these differences in subsequent analyses. The two primary outcome measures (belief that HIV treatment prevents transmission and belief that early HIV treatment is necessary) were slightly correlated with each other in 2013 ($r = -0.08$, $p = 0.003$) and 2015 ($r = 0.07$, $p = 0.02$).

HIV Treatment Prevents Transmission

In 2013, 2.6 % of 1316 participants were classified as agreeing that HIV treatment prevents transmission. This rose to 13.1 % of 1251 men in 2015 [adjusted odds ratio (AOR) = 2.57, 95 % confidence interval (CI) 2.07–3.20, $p < 0.001$, comparing the 2015 sample to the 2013 sample, controlling for confounders]. The increase was most pronounced among HIV-positive men (9.7–46.2 %; AOR = 4.02, 95 % CI 2.28–7.10, $p < 0.001$) compared with HIV-negative and untested men (2.0–10.0 %; AOR = 2.36, 95 % CI 1.86–3.00, $p < 0.001$).

The characteristics of men who agreed in 2015 that HIV treatment prevents transmission versus those who did not are shown in Table 2. Belief in TasP was unrelated to sexual identity, country of birth or employment status (analyses not shown). Multivariate logistic regression indicated that agreement that HIV treatment prevents transmission was significantly associated with being HIV-positive, having completed any tertiary education, reporting any condomless anal intercourse with casual male partners in the previous 6 months, and having ever used PEP. Men who lived in Queensland or a regional or rural area of their state or territory were less likely to agree that HIV treatment prevented transmission.

Table 1 Sample characteristics

	2013 sample (n = 1316), %	2015 sample (n = 1251), %	<i>t</i> or χ^2 (<i>p</i> value)
Mean age in years (SD)	32.0 (11.1)	33.7 (11.9)	3.40 (<0.001)
Sexual identity			33.81 (<0.001)
Gay	91.6	96.9	
Bisexual	6.5	2.6	
Other	2.0	0.5	
HIV status			24.77 (<0.001)
HIV-negative	73.4	79.1	
Untested/unknown status	19.5	12.4	
HIV-positive	7.1	8.5	
Country of birth			5.01 (0.03)
Australia	77.1	80.7	
Overseas	22.9	19.3	
State or territory			14.58 (0.04)
Australian Capital Territory	3.6	3.4	
New South Wales	31.8	33.7	
Northern Territory	0.4	1.0	
Queensland	20.1	19.3	
South Australia	5.6	7.3	
Tasmania	1.2	1.8	
Victoria	29.1	24.5	
Western Australia	8.2	9.1	
Residential location			15.85 (<0.001)
Capital city	75.8	68.7	
Other city	10.1	12.7	
Regional/rural area	14.1	18.5	
Employment			50.13 (<0.001)
Full-time	55.9	59.1	
Part-time	10.2	11.4	
Student	24.2	14.3	
Unemployed/retired/other	9.7	15.2	
Education			11.41 (0.001)
Up to Year 12 (high school)	28.4	34.6	
Trade certificate or university degree	71.6	65.4	
No. of male sex partners (past 6 months)			3.56 (0.17)
0–1	34.8	35.2	
2–10	46.8	43.8	
>10	18.4	21.0	
HIV status of regular male partner			2.65 (0.44)
No regular partner	44.2	42.8	
HIV-negative	43.8	44.2	
Untested/unknown status	7.4	7.1	
HIV-positive	4.6	5.9	
Anal intercourse with regular male partners (past 6 months)			14.73 (0.001)
No partners/no intercourse	35.1	32.1	

Table 1 Sample characteristics

	2013 sample (n = 1316), %	2015 sample (n = 1251), %	<i>t</i> or χ^2 (<i>p</i> value)
Consistent condom use	17.8	13.7	
Any anal intercourse without condoms	47.1	54.2	
Anal intercourse with casual male partners (past 6 months)			29.08 (<0.001)
No partners/no intercourse	42.4	40.0	
Consistent condom use	31.1	24.3	
Any anal intercourse without condoms	26.5	35.7	
Ever received post-exposure prophylaxis (PEP)			6.04 (0.01)
No	86.2	82.7	
Yes	13.8	17.3	
Personal experience in using condoms*			1.94 (0.16)
Negative/neutral (score < 4)	92.6	94.0	
Positive (score ≥ 4)	7.4	6.0	

t *t* test, χ^2 Chi square test, *p* probability, *SD* standard deviation
 * 9-item scale scored from 1 to 5

Early HIV Treatment is Necessary

In 2013, 71.8 % of participants were classified as agreeing that early HIV treatment is necessary and this increased to 75.3 % in 2015 (AOR = 1.13, 95 % CI 1.02–1.24, *p* = 0.02, comparing the 2015 sample to the 2013 sample, controlling for confounders). The increase was concentrated among HIV-positive men (40.9–60.4 %; AOR = 1.42, 95 % CI 1.03–1.97, *p* = 0.03) rather than HIV-negative and untested men (74.2–76.7 %; AOR = 1.10, 95 % CI 0.99–1.22, *p* = 0.07).

The characteristics of men who agreed in 2015 that early HIV treatment is necessary versus those who did not are shown in Table 3. Support for early treatment was unrelated to sexual identity, country of birth, residential location, number of male sex partners, anal intercourse with regular or casual partners, PEP use or the participant’s experience in using condoms (analyses not shown). Younger men were more likely to agree with the need for early HIV treatment. Belief that early HIV treatment is necessary was less likely among men who lived in Queensland or Victoria (compared with New South Wales) and those who were unemployed or retired.

Discussion

Our national surveys of Australian gay and bisexual men show that attitudes to HIV treatment for prevention and the early initiation of treatment have become more positive over the last 2 years. This coincides with the introduction of community education campaigns to promote the health and preventative benefits of HIV treatment, a greater focus on TasP in local HIV strategies and changes in prescribing guidelines to support early treatment.

The majority of Australian gay and bisexual men remain sceptical about TasP, but the proportion of men who agree that HIV treatment prevents transmission has increased from 3 % in 2013 to 13 % in 2015. The increase is most pronounced among HIV-positive men, among whom nearly half agree that treatment prevents transmission. A similar level of support has been observed in Canada and the UK [9, 11]. This suggests that Australian HIV-positive men may be more aware of the results from key trials, by exposure to community campaigns or through clinicians, for example. This is supported by the finding that belief in TasP was greater among men who lived in New South Wales and Victoria, the two states with the largest populations of gay and bisexual men and (arguably) more intensive promotion of the benefits of HIV treatment over the last 2 years. In contrast, men in regional and rural areas were less likely to believe in TasP, presumably because they are less likely to access or be exposed to discussion or information about TasP.

Consistent with our previous research [10], we found that men at higher risk of HIV, evidenced by condomless sex with casual partners, the use of PEP, having an HIV-positive partner or a greater number of partners overall, were more likely to agree that HIV treatment prevents transmission. There is a range of possible explanations for this finding. Since the advent of combination antiretroviral treatment, men who are at higher risk of HIV have been consistently found to be more optimistic about the capacity to avoid HIV [7, 22]. This optimism may be accurate (effective treatments do reduce HIV transmission) but it may also be misplaced (HIV-negative and untested men rarely limit sex to diagnosed HIV-positive partners on treatment, so HIV treatment cannot be relied upon to consistently protect them). The experience of PEP, which is generally effective in preventing HIV if the course of drugs is adhered to [23], may foster greater confidence in the effectiveness of HIV treatments in preventing transmission. It is possible that as pre-exposure prophylaxis (PrEP) becomes more available that it will have a similar effect in boosting confidence about TasP. Gay and bisexual men with HIV-positive partners may be more likely to believe in TasP because they have greater exposure to knowledge

of HIV treatments and prevention science. Qualitative research also suggests that men in serodiscordant couples are reassured by scientific findings about the efficacy of TasP, giving them greater confidence in managing the risk of transmission within their relationships [13].

In 2013 we found that a majority of Australian gay and bisexual men (72 %) supported the idea of early HIV treatment and this modestly increased to 75 % in 2015. The increase was largely concentrated among HIV-positive men, who in 2013 were much less supportive of early treatment than HIV-negative and untested men. In fact, in contrast to our previous research [10], we no longer find that HIV-positive men or their partners are less likely to support early treatment. This suggests that concerns about early treatment (such as perceiving little personal benefit of early treatment or feeling compelled to start treatment to protect others) have been allayed to some degree among HIV-positive men and their partners, echoing the evolving views of HIV clinicians [12, 13, 18]. Consistent with our previous research [10], younger men were more supportive of early treatment. We also observed that men in New South Wales, where the *Ending HIV* campaign originated, were much more likely to support the idea of early treatment than men residing in Queensland or Victoria, perhaps reflecting the period of time the campaign has been active in the respective states. Men who were unemployed or retired were less likely than men in full-time employment to support early treatment, perhaps reflecting concerns about the cost of medicines for those on lower incomes.

Our results are limited in a number of ways. We used cross-sectional surveys that could not identify causal processes or analyse changes in the attitudes of the same men over time. As in previous years, we did not give participants any background information about the concept of TasP or current recommendations about when to initiate treatment. Neither did we assess participants' exposure to education campaigns, debates or sources of information about HIV treatment (so our observations about the impact of campaigns are speculative). The profile of participants we recruited is similar to community samples of Australian gay and bisexual men in which HIV risk tends to be elevated [20], but is not a representative sample of gay and bisexual men in Australia [24]. The level of PEP use we observed in our sample appears high, but is similar to levels of lifetime use observed in other studies [25], perhaps reflecting that PEP has been widely available in Australia since 2001 [23].

Our results have a number of implications. They show that Australian gay and bisexual men remain largely supportive of the early initiation of HIV treatment, but most remain sceptical about the use of TasP. As we have noted before, this suggests greater confidence in the personal

Table 2 Factors associated with agreement that HIV treatments prevents transmission (in 2015)

	Disagreed/neutral (n = 1087), n (%)	Agreed (n = 164), n (%)	Unadjusted OR (95 % CI)	<i>p</i>	Adjusted OR (95 % CI)	<i>p</i>
Mean age in years (SD)	33.2 (11.9)	36.9 (11.6)	1.02 (1.01–1.03)	<0.001	1.00 (0.98–1.01)	0.70
HIV status						
HIV-negative	81.0	67.1	Ref.		Ref.	
Untested/unknown status	13.8	3.0	0.27 (0.11–0.66)	0.005	0.52 (0.20–1.35)	0.18
HIV-positive	5.2	29.9	6.88 (4.47–10.57)	<0.001	6.22 (3.74–10.34)	<0.001
State or territory						
New South Wales	32.7	40.2	Ref.		Ref.	
Queensland	20.3	12.2	0.49 (0.29–0.83)	0.007	0.49 (0.27–0.88)	0.02
Victoria	23.4	32.3	1.12 (0.76–1.67)	0.57	0.93 (0.60–1.44)	0.75
Other states/territories	23.6	15.2	0.52 (0.32–0.85)	0.009	0.62 (0.37–1.06)	0.08
Residential location						
Capital city	66.1	86.0	Ref.		Ref.	
Other city	13.9	4.9	0.27 (0.13–0.56)	<0.001	0.52 (0.24–1.12)	0.09
Regional/rural area	20.0	9.1	0.35 (0.20–0.61)	<0.001	0.44 (0.24–0.80)	0.007
Education						
Up to Year 12 (high school)	36.6	21.3	Ref.		Ref.	
Trade certificate or university degree	63.4	78.7	2.13 (1.44–3.16)	<0.001	1.49 (0.96–2.31)	0.08
No. of male sex partners in past 6 months						
0–1	38.3	14.6	Ref.		Ref.	
2–10	43.1	48.8	2.96 (1.84–4.76)	<0.001	1.37 (0.64–2.95)	0.41
>10	18.7	36.6	5.12 (3.10–8.47)	<0.001	1.52 (0.67–3.51)	0.32
HIV status of regular male partner						
No regular partner	42.5	44.5	Ref.		Ref.	
HIV-negative	45.1	38.4	0.81 (0.57–1.17)	0.26	1.04 (0.69–1.56)	0.84
Untested/unknown status	7.5	4.3	0.54 (0.24–1.21)	0.14	0.93 (0.39–2.20)	0.87
HIV-positive	4.9	12.8	2.51 (1.43–4.40)	0.001	1.70 (0.87–3.32)	0.12
Anal intercourse with casual male partners (past 6 months)						
No partners/no intercourse	43.4	17.1	Ref.		Ref.	
Consistent condom use	24.5	23.2	2.41 (1.45–4.01)	0.001	1.75 (0.81–3.78)	0.16
Any anal intercourse without condoms	32.1	59.8	4.73 (3.04–7.37)	<0.001	2.48 (1.18–5.21)	0.02
Ever received post-exposure prophylaxis (PEP)						
No	84.5	70.1	Ref.		Ref.	
Yes	15.5	29.9	2.33 (1.61–3.38)	<0.001	1.66 (1.09–2.52)	0.02
Personal experience in using condoms*						
Negative/neutral (score < 4)	93.5	97.6	Ref.		Ref.	
Positive (score ≥ 4)	6.5	2.4	0.36 (0.13–0.99)	0.05	0.49 (0.17–1.43)	0.19

CI confidence interval, OR odds ratio, *p* probability, SD standard deviation

* 9-item scale scored from 1 to 5

health benefits of treatment but not the use of treatment to prevent transmission [10, 19]. Belief in the effectiveness of TasP has increased over the last few years, particularly among HIV-positive men, suggesting attempts to explain the preventative benefits of HIV treatment have had impact. However, there is now a large gap in attitudes between HIV-positive men and their HIV-negative and

untested peers, with HIV-positive men holding much more positive views of TasP. This may be a consequence of HIV-positive men being more exposed to and engaged with HIV treatment information and being more open to a strategy that challenges notions of HIV and infectiousness. It remains unclear whether such a gap in knowledge and comfort with TasP is socially divisive, with HIV-positive

Table 3 Factors associated with agreement that early HIV treatment is necessary (in 2015)

	Disagreed/neutral (n = 309), n (%)	Agreed (n = 942), n (%)	Unadjusted OR (95 % CI)	<i>p</i>	Adjusted OR (95 % CI)	<i>p</i>
Mean age in years (SD)	38.7 (12.0)	32.0 (11.5)	0.96 (0.95–0.97)	<0.001	0.96 (0.95–0.98)	<0.001
HIV status						
HIV-negative	79.0	79.2	Ref.		Ref.	
Untested/unknown status	7.4	14.0	1.88 (1.18–2.99)	0.008	1.52 (0.92–2.52)	0.11
HIV-positive	13.6	6.7	0.50 (0.33–0.75)	0.001	0.77 (0.49–1.21)	0.27
State or territory						
New South Wales	28.8	35.2	Ref.		Ref.	
Queensland	21.7	18.5	0.70 (0.48–1.00)	0.05	0.58 (0.40–0.86)	0.006
Victoria	27.5	23.6	0.70 (0.50–0.99)	0.04	0.66 (0.46–0.94)	0.02
Other states/territories	22.0	22.7	0.84 (0.59–1.21)	0.35	0.70 (0.48–1.02)	0.06
Employment						
Full-time	58.3	59.3	Ref.		Ref.	
Part-time	11.3	11.5	0.99 (0.66–1.51)	0.98	0.98 (0.63–1.51)	0.91
Student	7.1	16.7	2.30 (1.43–3.70)	0.001	1.41 (0.85–2.33)	0.19
Unemployed/retired/other	23.3	12.5	0.53 (0.38–0.74)	<0.001	0.64 (0.45–0.92)	0.02
HIV status of regular male partner						
No regular partner	40.5	43.5	Ref.		Ref.	
HIV-negative	42.7	44.7	0.97 (0.74–1.29)	0.84	0.99 (0.74–1.33)	0.95
Untested/unknown status	7.8	6.9	0.83 (0.50–1.37)	0.46	0.60 (0.35–1.03)	0.07
HIV-positive	9.1	4.9	0.50 (0.30–0.83)	0.008	0.70 (0.41–1.22)	0.21

CI confidence interval, *M* mean, *OR* odds ratio, *p* probability, *SD* standard deviation

men increasingly confident that HIV treatment prevents transmission and most HIV-negative and untested men remaining unconvinced [7, 26]. It is far from clear how a greater reliance on TasP by HIV-positive men will be taken into account by state and territory laws about HIV status disclosure and transmission. These laws tend to specify that ‘reasonable precautions’ must be taken to prevent HIV transmission, but they do not specify whether having an undetectable viral load is considered ‘reasonable’ [27]. Related issues have been alluded to in research in the Netherlands, in which it was suggested that HIV-positive men may not disclose their HIV status prior to condomless sex when they have an undetectable viral load [28], troubling the notion of shared responsibility for prevention and potentially fuelling HIV stigma between casual sexual partners [29, 30].

The current gap in belief about TasP may close over time, and it may have little or no impact on sexual practices. However, our results highlight the need to assess both the intended and unintended consequences of antiretroviral-based HIV prevention, using both quantitative and qualitative research methods [31, 32].

Conclusion

In conclusion, we have found that Australian gay and bisexual men’s attitudes to TasP and the early initiation of treatment have become more positive over time. HIV-positive men are much more likely to believe in the effectiveness of TasP than HIV-negative and untested men—a difference that has widened over the last 2 years. We recommend continued monitoring of the social and behavioural effects of the promotion of HIV treatment as prevention.

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