

# Increased awareness of event-driven PrEP and knowledge of how to use it: results from a cross-sectional survey of gay and bisexual men in Australia

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**Handling Editor:**

Eric Chow

**Received:** 8 June 2022  
**Accepted:** 13 July 2022  
**Published:** 3 August 2022

**Cite this:**

Chan C *et al.* (2022)  
*Sexual Health*, **19**(6), 501–508.  
doi:[10.1071/SH22101](https://doi.org/10.1071/SH22101)

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## ABSTRACT

**Background.** Recent changes to Australian PrEP prescribing guidelines support the use of event-driven pre-exposure prophylaxis (ED-PrEP) to prevent HIV among gay and bisexual men (GBM). Social marketing campaigns to increase awareness of ED-PrEP were conducted in early 2021. This study aimed to assess the awareness and knowledge of this method after these campaigns. **Methods.** We conducted a national cross-sectional online survey about PrEP knowledge and attitudes from March to May 2021. Participants were asked if they had heard of ED-PrEP. Among aware participants, questions about the ‘2-1-1’ method were asked to assess knowledge. Bivariate and multivariate logistic regression analyses were conducted to assess the characteristics of those who were aware of ED-PrEP, and those who had correct knowledge of ED-PrEP. Analysis was restricted to non-HIV-positive cis-GBM who were aware of PrEP. **Results.** Among the 419 participants eligible for this analysis, 286 (68.3%) had heard of ED-PrEP. Awareness was associated with living in a postcode with  $\geq 10\%$  gay men, PrEP experience, and belief ED-PrEP is effective. Of these 286 participants, 125 (43.7%) correctly answered questions about how to take ED-PrEP. Correct knowledge was associated with PrEP experience and belief ED-PrEP is effective. **Conclusions.** A growing proportion of GBM are aware of ED-PrEP, but many still do not know how to take it as per clinical guidelines. More work is needed to increase knowledge among GBM to promote effective use of this method.

**Keywords:** event-driven PrEP, gay men, health promotion, HIV prevention, HIV/AIDS, men who have sex with men, on-demand PrEP, pre-exposure prophylaxis.

## Introduction

Although oral HIV pre-exposure prophylaxis (PrEP) is most commonly taken daily,<sup>1</sup> event-driven PrEP (ED-PrEP), also known as ‘on-demand’ PrEP, is also an effective method of taking PrEP among gay, bisexual, and other men who have sex with men (GBM) to prevent HIV infection.<sup>2</sup> For maximum efficacy, individuals must take a loading dose of two pills 2–24 h before sex and then take a pill daily for the following 2 days after sex.<sup>2,3</sup> This is known as the ‘2-1-1’ method, a term this paper will use interchangeably with ED-PrEP. This method is currently endorsed in several PrEP prescribing guidelines globally<sup>3–5</sup> and is an established method in many countries in Europe,<sup>6,7</sup> and had a significant use during a multinational West African study.<sup>8</sup> Greater uptake of this method has potential to increase PrEP coverage among GBM who do not find daily PrEP suitable.

There has been rapid uptake of PrEP in Australia among GBM since the cost became subsidised through the Pharmaceutical Benefits Scheme in 2018, and in 2021 Australian behavioural surveillance data, 74% of GBM taking PrEP took it daily.<sup>9,10</sup> Despite being incorporated into the Australian PrEP prescribing guidelines in 2019,<sup>5</sup> awareness and use of ED-PrEP among Australian GBM remained low in 2021.<sup>9</sup> There is evidence that a growing proportion of GBM who are aware of ED-PrEP would prefer it over daily

PrEP.<sup>7,8,11–13</sup> In a study of PrEP-experienced Australian GBM in 2020, 21.2% preferred it over all other modalities, including daily PrEP, long-acting injectables, or an implant.<sup>13</sup> However, a lack of awareness of this method in Australia is a likely barrier to increased uptake. This method has not yet received regulatory approval from the Therapeutic Goods Administration, the medicine and therapeutic regulatory agency of the Australian Government,<sup>14</sup> which could lead to hesitancy to discuss it with potential PrEP patients among clinicians and reluctance from clinicians to provide off-label prescriptions.<sup>15,16</sup> Furthermore, there is evidence that GBM who are aware of ED-PrEP may not know how to take it correctly,<sup>17</sup> and some studies have shown many GBM often miss the loading dose.<sup>18,19</sup> A 2020 study of PrEP-experienced Australian GBM found that only one-eighth of those aware of ED-PrEP knew how to take it correctly.<sup>17</sup> Incorrect knowledge of how to take ED-PrEP is a cause of concern as missing doses is likely to increase the risk of HIV infection.<sup>20</sup>

In Australia, HIV prevention education among GBM is largely implemented by government-funded community-based organisations, and comprises large-scale digital, print, and outdoor social marketing campaigns, targeted digital social marketing, group- and individual-level peer education, and community development.<sup>21,22</sup> Prior to 2021, although several PrEP-focused social marketing campaigns had been implemented, they focused on daily PrEP only and there had not been any large-scale campaigns to introduce ED-PrEP. Between February and April 2021, social marketing campaigns targeting GBM were implemented by two of Australia's largest HIV community-based organisations to increase general awareness of PrEP and educate GBM about how to take it.<sup>23</sup> This coincided with the Sydney Mardi Gras festival, the largest pride event in Australia. This included advertisements to introduce ED-PrEP and periodic PrEP (taking daily PrEP for a discrete period such as a month), and to reinforce the effectiveness of daily PrEP. These advertisements were displayed on billboards and posters in the state of New South Wales and shown online nationally, including links to further information about the different forms of PrEP. The aim of this study was to assess the awareness and knowledge of ED-PrEP among GBM after the implementation of these large-scale social marketing campaigns.

## Methods

### Participants and procedures

We conducted a national cross-sectional online survey about PrEP knowledge and attitudes between 16 March 2021 and 2 May 2021 using the survey platform Qualtrics (Provo, UT, USA). The survey was promoted through paid social media advertising on Facebook and Grindr. The study was approved by the UNSW Human Research Ethics Committee

(HC200879) and the ethics review committee of the community organisation, ACON (2020/26). Participants were eligible to participate if they: were a man aged  $\geq 18$  years, lived in Australia, and identified as gay or bisexual or had had sex with another man in the past 5 years.

### Measures

Participants were asked 'Have you heard of PrEP?' (yes/no). Participants who were aware of PrEP were asked 'Have you heard of event-based dosing before now (i.e. on-demand, event-based, event-driven?' (yes/no). Participants who had heard of ED-PrEP were asked three knowledge questions (correct response is indicated with an asterisk): 'How many pills need to be taken before sex?' (None, One, \*Two, Three, I don't know); 'When should the first dose be taken?' (More than 24 h before sex, \*At least 2 h before sex, At the time of sex, Immediately after sex, The day after sex, I don't know); and 'For how many days after sex should you take one pill per day?' (None, One, \*Two, Three, I don't know). Participants were considered to have correct knowledge if they correctly responded to all three items.

We collected data on demographics, including age, sexual identity, current gender identity, sex recorded at birth, postcode of residence, and country of birth. Participants selected their age group from 'Under 25', '25–29', '30–39', '40–49', '50–59' or '60 and older'. Using a published method,<sup>24</sup> participants' postcode of residence were categorised as having an estimated resident gay male population of  $<10\%$  or  $\geq 10\%$ . Participants were asked about HIV serostatus, history of PrEP use, attitudes towards PrEP, condom use with casual partners, and number of sexual partners in the previous 3 months. Those who reported either current or previous PrEP use were asked how they took PrEP in the previous 3 months. Participants were asked how much they believed in the effectiveness of PrEP dosing regimens in preventing HIV infection, including daily PrEP, ED-PrEP, periodic PrEP, and time-based PrEP (taking pills on certain days of the week but not every day). This was assessed with a six-point Likert scale from 'Completely ineffective' to 'Completely effective'. We dichotomised responses to 'Ineffective' and 'Effective' respectively. Participants were asked whether they agreed or disagreed with statements about PrEP using a five-point Likert scale from 'Strongly disagree' to 'Strongly agree'. We dichotomised responses as 'Agree' or 'Not agree', with the neutral option in the latter category. Participants were asked if they had seen specific PrEP campaign advertisements and those who confidently recalled seeing them were categorised as being 'Exposed to campaign materials'.

### Analyses

Analyses were restricted to cisgender GBM, as current PrEP prescribing guidelines only recommend ED-PrEP for this group.<sup>5,25</sup> Participants who had missing data on key

demographic and PrEP awareness variables were excluded. We compared demographic information of included and excluded participants using a Chi-squared test of homogeneity. Analyses on awareness of ED-PrEP were restricted to participants who were aware of PrEP generally, and analyses on correct knowledge of how to take ED-PrEP were restricted to participants who were aware of ED-PrEP. Factors associated with these two outcomes were examined using bivariable and multivariable logistic regression analyses. Variables significant at the bivariable level were block-entered into the multivariable models.

## Results

Overall, 828 participants who met the eligibility criteria for this analysis completed the survey. Of these, 220 were not eligible for this specific analysis because they were HIV positive ( $n = 40$ ) or were not aware of PrEP ( $n = 180$ ). Of the remaining 608 participants, 189 did not respond to critical questions and were excluded. Thus, the analysis was restricted to 419 participants (68.9% of those eligible for this analysis). Compared to those who were included for analysis, the 189 participants who were excluded from analysis were more likely to not identify as gay ( $P = 0.016$ ). There were no significant differences between the included and excluded participants based on age ( $P = 0.421$ ), country of birth ( $P = 0.909$ ), living in a postcode with  $\geq 10\%$  gay men ( $P = 0.706$ ), or relationship status ( $P = 0.583$ ).

Most participants ( $n = 290$ , 69.4%) were born in Australia, with 255 (60.9%) living in New South Wales, 52 (12.4%) in Queensland, 47 (11.2%) in Victoria, and 65 (15.5%) in other states. Most identified as gay ( $n = 338$ , 80.7%), with 79 (18.9%) living in a postcode with  $\geq 10\%$  gay men, and 328 (78.3%) in a postcode with  $< 10\%$  gay men. Just over half of participants were not in a relationship ( $n = 238$ , 56.8%), 106 (25.3%) were in a monogamous relationship, and 73 (17.4%) were in an open relationship. Over one-third ( $n = 152$ , 36.3%) had seen advertisements from the PrEP social marketing campaigns that ran from February to April 2021.

Among the sample, 172 (41.3%) were currently taking PrEP, 58 (13.9%) had previously taken PrEP, and 187 (44.8%) had never taken PrEP. Among those who were PrEP-experienced ( $n = 230$ ), in the past 3 months, nearly three-quarters ( $n = 170$ , 73.9%) took PrEP daily, 33 (14.4%) took ED-PrEP, five (2.2%) took PrEP another way, and the remaining 22 (9.6%) did not take PrEP in the previous 3 months.

### ED-PrEP awareness

Over two-thirds of participants ( $n = 286$ , 68.3%) had heard of ED-PrEP. At the bivariable level, awareness of ED-PrEP was associated with identifying as gay (OR = 3.51, 95% CI = 2.12–5.81,  $P < 0.001$ ), living in a postcode with  $\geq 10\%$

gay men (OR = 6.87, 95% CI = 2.90–16.27,  $P < 0.001$ ), having seen social marketing campaign materials (OR = 5.12, 95% CI = 3.00–8.79,  $P < 0.001$ ), being in an open relationship (OR = 6.50, 95% CI = 2.58–16.37,  $P < 0.001$ ), being PrEP-experienced (OR = 9.42, 95% CI = 5.75–15.44,  $P < 0.001$ ), belief that daily PrEP is effective (OR = 5.67, 95% CI = 3.20–10.07,  $P < 0.001$ ), belief that ED-PrEP is effective (OR = 10.30, 95% CI = 5.68–18.75,  $P < 0.001$ ), belief that PrEP is affordable (OR = 4.42, 95% CI = 2.79–7.02,  $P < 0.001$ ), not believing condoms should still be used while on PrEP (OR = 0.54, 95% CI = 0.35–0.83,  $P = 0.005$ ), belief that getting more people on PrEP is important (OR = 1.73, 95% CI = 2.23–14.70,  $P < 0.001$ ), and having  $\geq 11$  sexual partners in the past 3 months (OR = 5.73, 95% CI = 2.23–14.70,  $P < 0.001$ ). ED-PrEP awareness was not associated with age or country of birth at the bivariable level (see Table 1). At the multivariable level, awareness of ED-PrEP was independently associated with living in a postcode with  $\geq 10\%$  gay men (aOR = 2.93, 95% CI = 1.03–8.37,  $P = 0.044$ ), being PrEP-experienced (aOR = 3.77, 95% CI = 1.96–7.26,  $P < 0.001$ ) and believing ED-PrEP is effective at preventing HIV infection (aOR = 6.49, 95% CI = 3.17–13.31,  $P < 0.001$ ; Table 1).

### ED-PrEP knowledge

Of the 286 who had heard of ED-PrEP, 125 (43.7%) correctly identified the three components of the '2-1-1' dosing regimen that we asked about, and 66 (23.2%) answered 'Don't know' to all three questions (Table 2). Participants were most likely to correctly know that the loading dose is two pills (65.0%) and that it should be taken at least 2 h before sex (60.1%). Participants were slightly less likely to know that a pill should be taken daily for the following 2 days after sexual exposure (51.4%). PrEP-experienced participants ( $n = 203$ ) were significantly more likely than non-PrEP-experienced participants ( $n = 83$ ) to have correct knowledge (52.2% vs 22.9%,  $\chi^2 = 20.6$ ,  $P < 0.001$ ).

Among those aware of ED-PrEP ( $n = 286$ ), at the bivariable level, correct knowledge was associated with seeing campaign materials (OR = 1.66, 95% CI = 1.04–2.66,  $P = 0.035$ ), being PrEP-experienced (OR = 3.68, 95% CI = 2.06–6.58,  $P < 0.001$ ), belief that ED-PrEP is effective (OR = 4.80, 95% CI = 2.77–8.35,  $P < 0.001$ ), not believing condoms should still be used while on PrEP (OR = 0.60, 95% CI = 0.37–0.96,  $P = 0.033$ ), and having  $\geq 11$  sexual partners in the previous 3 months (OR = 2.08, 95% CI = 1.14–3.82,  $P = 0.018$ ). Correct knowledge was not associated with age, country of birth, sexual identity, postcode of residence, relationship status, belief that daily PrEP is effective, belief PrEP is affordable, or belief getting more people on PrEP is important (Table 3). At the multivariable level, correct knowledge was independently associated with being PrEP-experienced (aOR = 2.81, 95% CI = 1.49–5.29,  $P = 0.001$ ) and believing ED-PrEP is effective at preventing HIV

**Table 1.** Bivariate and multivariate logistic regression analyses of awareness of event-driven PrEP among participants aware of PrEP (N = 419).

	Not aware of ED-PrEP, n (%)	Aware of ED-PrEP, n (%)	OR (95% CI)	P-value	aOR (95% CI)	P-value
Age (years)						
<25	16 (13.8)	28 (11.4)	<b>Ref</b>	–		
≥25	100 (86.2)	217 (88.6)	1.24 (0.64–2.40)	0.522		
Country of birth						
Australia	96 (73.3)	192 (67.4)	0.75 (0.48–1.19)	0.226		
Overseas	35 (26.7)	93 (32.6)	<b>Ref</b>	–		
Sexual identity						
Gay	87 (66.4)	250 (87.4)	3.51 (2.12–5.81)	<0.001	1.96 (0.95–4.04)	0.067
Not gay	44 (33.6)	36 (12.6)	<b>Ref</b>	–	Ref	–
Postcode of residence by % gay men						
<10% gay postcode	119 (36.4)	208 (63.6)	<b>Ref</b>	–		
≥10% gay postcode	6 (7.7)	72 (92.3)	6.87 (2.90–16.27)	<0.001	2.93 (1.03–8.37)	<b>0.044</b>
Exposure to PrEP campaign advertisements						
Saw campaign ads	19 (12.5)	133 (87.5)	5.12 (3.00–8.79)	<0.001	1.88 (0.92–3.83)	0.084
Did not see ads	112 (42.3)	153 (57.7)	<b>Ref</b>	–		
Relationship status						
Monogamous	39 (36.8)	67 (63.2)	<b>Ref</b>	–		
Open	6 (8.2)	67 (91.8)	6.50 (2.58–16.37)	<0.001	2.32 (0.75–7.25)	0.146
Not in relationship	85 (36.0)	151 (64.0)	1.03 (0.64–1.66)	0.890	0.84 (0.42–1.70)	0.628
PrEP history						
PrEP experienced	27 (11.7)	203 (88.3)	9.42 (5.75–15.44)	<0.001	3.77 (1.96–7.26)	<0.001
Non-PrEP experienced	104 (55.6)	83 (44.4)	<b>Ref</b>	–	<b>Ref</b>	–
PrEP attitudes						
Believe daily PrEP is effective	78 (66.7)	261 (91.9)	5.67 (3.20–10.07)	<0.001	1.49 (0.70–3.19)	0.303
Believe ED-PrEP is effective	15 (14.0)	175 (62.7)	10.30 (5.68–18.75)	<0.001	6.49 (3.17–13.31)	<0.001
PrEP is affordable	33 (25.8)	172 (60.6)	4.42 (2.79–7.02)	<0.001	1.62 (0.87–3.03)	0.128
Condoms should still be used while on PrEP	89 (67.9)	151 (53.2)	0.54 (0.35–0.83)	<b>0.005</b>	1.00 (0.54–1.87)	0.999
Getting more people on PrEP is important	100 (76.9)	242 (85.2)	1.73 (1.02–2.92)	<b>0.040</b>	1.31 (0.61–2.78)	0.487
Number of sexual partners in previous 3 months						
0–10	126 (96.2)	233 (81.5)	<b>Ref</b>	–	<b>Ref</b>	–
≥11	5 (3.8)	53 (18.5)	5.73 (2.23–14.70)	<0.001	1.25 (0.37–4.24)	0.715

Bold values are significant at the  $P < 0.05$  level.

Ref, reference.

infection (aOR = 4.15, 95% CI = 2.34–7.36,  $P < 0.001$ ; Table 3).

## Discussion

Awareness of ED-PrEP among PrEP-aware participants was moderately high at two-thirds (68.3%), but knowledge of how to take ED-PrEP remains suboptimal. Nearly one-quarter (23.2%) of participants who were aware of ED-PrEP did not even attempt to guess any of the three questions

concerning how to take ED-PrEP, and this was higher among non-PrEP-experienced participants. Less than half (43.7%) of the participants correctly recalled the three components of the ‘2-1-1’ method, which was significantly lower among non-PrEP-experienced participants. PrEP-experience and belief that ED-PrEP is effective were independently associated with both awareness and knowledge, whereas living in a postcode with a high concentration of gay men was only independently associated with awareness.

Both ED-PrEP awareness and knowledge were higher than in previous Australian studies. Previous work in

**Table 2.** Knowledge of ED-PrEP dosing regimen among GBM who were aware of ED-PrEP.

	Total sample (n = 286)		PrEP-experienced (n = 203)		Non-PrEP-experienced (n = 83)		$\chi^2$	P-value
	Number correct	%	Number correct	%	Number correct	%		
First dose taken 2–24 h before sex	172	60.1	141	69.5	31	37.4	25.3	<b>&lt;0.001</b>
First dose is two pills	186	65.0	157	77.3	29	34.9	46.6	<b>&lt;0.001</b>
Take a pill daily for the next 2 days	147	51.4	122	60.1	25	30.1	21.2	<b>&lt;0.001</b>
All correct	125	43.7	106	52.2	19	22.9	20.6	<b>&lt;0.001</b>
All I don't know	66	23.2	27	13.4	39	47.0	37.7	<b>&lt;0.001</b>

Bold values are significant at the  $P < 0.05$  level.

**Table 3.** Bivariate and multivariate logistic regression analyses of correct knowledge of ED-PrEP among GBM aware of ED-PrEP ( $N = 286$ ).

	Some incorrect knowledge, n (%)	All correct knowledge, n (%)	OR (95% CI)	P-value	aOR (95% CI)	P-value
Age (years)						
<25	18 (12.8)	10 (9.6)	Ref	–		
≥25	123 (87.2)	94 (90.4)	1.37 (0.71–3.11)	0.445		
Country of birth						
Australia	110 (68.8)	82 (65.6)	0.87 (0.53–1.43)	0.574		
Overseas	50 (31.3)	43 (34.4)	Ref	–		
Sexual identity						
Gay	140 (87.0)	15 (12.0)	1.10 (0.54–2.23)	0.792		
Not gay	21 (13.0)	110 (88.0)	Ref	–		
Postcode of residence by % gay men						
<10% gay postcode	120 (76.4)	88 (71.5)	Ref	–		
≥10% gay postcode	37 (23.6)	35 (28.5)	1.29 (0.75–2.21)	0.354		
Exposure to PrEP campaign advertisements						
Saw campaign ads	66 (41.0)	67 (53.6)	1.66 (1.04–2.66)	<b>0.035</b>	1.25 (0.73–2.12)	0.414
Did not see ads	95 (59.0)	58 (46.4)	Ref	–		
Relationship status						
Monogamous	45 (28.1)	22 (17.6)	Ref	–		
Open	34 (21.3)	33 (26.4)	2.00 (0.99–4.00)	0.055		
Not in relationship	81 (50.6)	70 (56.0)	1.77 (0.97–3.23)	0.064		
PrEP history						
PrEP experienced	97 (60.3)	106 (84.8)	3.68 (2.06–6.58)	<b>&lt;0.001</b>	2.81 (1.49–5.29)	<b>0.001</b>
Non-PrEP experienced	64 (39.8)	19 (15.2)	Ref	–		
PrEP attitudes						
Believe daily PrEP is effective	142 (89.3)	119 (95.2)	2.37 (0.91–6.21)	0.078		
Believe ED-PrEP is effective	74 (47.7)	101 (81.5)	4.80 (2.77–8.35)	<b>&lt;0.001</b>	4.15 (2.34–7.36)	<b>&lt;0.001</b>
PrEP is affordable	91 (56.9)	81 (65.3)	1.43 (0.88–2.32)	0.149		
Condoms should still be used while on PrEP	94 (58.8)	57 (46.0)	0.60 (0.37–0.96)	<b>0.033</b>	0.66 (0.39–1.12)	0.121
Getting more people on PrEP is important	136 (85.0)	106 (85.5)	1.04 (0.54–2.01)	0.909		
Number of sexual partners in previous 3 months						
0–10	139 (86.3)	94 (75.2)	Ref	–		
≥11	22 (13.7)	31 (24.8)	2.08 (1.14–3.82)	<b>0.018</b>	1.16 (0.59–2.28)	0.672

Bold values are significant at the  $P < 0.05$  level.

Ref, reference.

mostly PrEP-experienced samples in Australia had found only one-third of GBM were aware of ED-PrEP in 2018,<sup>12</sup> and this had increased to two-thirds by the start of 2020.<sup>17</sup> Compared to these early adopters of PrEP, our sample, recruited in 2021, with approximately half PrEP-experienced and non-PrEP-experienced participants, had overall comparable levels of ED-PrEP awareness to highly engaged PrEP users. The incorporation of ED-PrEP into Australian PrEP prescribing guidelines in 2019 and the social marketing campaigns in 2020 may have contributed to the increased awareness of ED-PrEP between 2018 and 2021. There was moderate knowledge of how to take ED-PrEP correctly at 43.7%, with correct knowledge being reported in 52.2% of PrEP-experienced participants and more than one-fifth of non-PrEP-experienced GBM. Despite poorer knowledge among non-PrEP-experienced GBM, their knowledge was still higher than previous PrEP-experienced samples that showed only one-eighth of PrEP early adopters in Australia had correct knowledge.<sup>17</sup> As with awareness, the increase in knowledge could be attributable to the changes to the PrEP guidelines as well as time passing for the circulation of these changes in community, social, and clinical settings.

Factors associated with ED-PrEP awareness and knowledge were consistent with previous work. The association between ED-PrEP awareness and living in an area with a high concentration of gay men may indicate that highly connected GBM are more likely to be exposed to, or find information about, ED-PrEP and PrEP. PrEP-experienced GBM were more likely to be aware of ED-PrEP and have correct knowledge, potentially because they are likely to have engaged with PrEP information while taking PrEP, and more likely to be aware of developments in PrEP than those who have never initiated PrEP. Our sample reported ED-PrEP use at 14.4% among PrEP-experienced participants, which is higher compared to previous pre-coronavirus disease 2019 (COVID-19) Australian samples at roughly 5–10%<sup>17,26</sup> but comparable to studies conducted after the onset of COVID-19.<sup>9</sup> The increase in knowledge may reflect increased uptake, as GBM who utilised ED-PrEP are more likely to seek out how to take ED-PrEP than those who had no intention of taking ED-PrEP. Although belief in the effectiveness of ED-PrEP was associated with awareness, it is possible that awareness of ED-PrEP was the precursor to believing in its effectiveness. Similarly, having knowledge on how to take ED-PrEP, as per clinical guidelines, can further reinforce its legitimacy as an effective PrEP-dosing regimen. However, 47.7% of those with incorrect knowledge still believed that ED-PrEP was effective, so the direction of the relationship between belief in effectiveness and knowledge is still not clear.

To increase PrEP coverage, increasing awareness should become a priority among those who had previously not considered PrEP due to a perception that PrEP must be taken daily. Previous studies have demonstrated that GBM often chose ED-PrEP over daily PrEP for a variety of factors

including difficulties with daily pill taking, infrequent sex, fear of long-term side-effects of daily PrEP, and cost.<sup>27–29</sup> As ED-PrEP is suitable for those who have infrequent sex, there is potentially a sub-population of GBM who have not initiated daily PrEP due to their lower sexual activity who could still benefit from ED-PrEP to remain protected from HIV.<sup>30</sup> Further work is needed to target GBM that would be suitable for ED-PrEP who may perceive PrEP as not being appropriate for them as they still associate it with daily PrEP.

As more GBM who are considering PrEP become aware of this method, hesitancy among clinicians to prescribe ED-PrEP could be a significant barrier to uptake.<sup>15,16</sup> Although several countries, including Australia, have incorporated ED-PrEP into clinical guidelines, there is not yet regulatory approval in any country for ED-PrEP. In Australia, the Therapeutic Goods Administration only lists daily dosing in their approved dosing regimens,<sup>14</sup> which could reinforce hesitancy among clinicians. This also means that the '2-1-1' method is not printed on PrEP packaging unless the clinician manually alters the prescription. The global lack of regulatory approval may be related to a lack of financial incentive for pharmaceutical companies to request a change to the listing to a regimen that requires fewer pills.<sup>31</sup> However, this relies on the clinician being aware of this dosing regimen. More work is needed to increase awareness of ED-PrEP among clinicians and reduce hesitancy from clinicians to prescribe ED-PrEP to those who would be suitable for ED-PrEP.

As more people use ED-PrEP, measuring adherence to ED-PrEP, and PrEP generally, becomes more challenging. Some studies find the coverage of sex acts from ED-PrEP is lower compared to daily PrEP,<sup>8,18,32</sup> which is a cause of concern. In contrast, other studies have found adherence to ED-PrEP and daily PrEP comparable and high.<sup>19,33</sup> Assessing prevention-effective adherence, that is, having adequate levels of PrEP in the body at the time of potential sexual exposures,<sup>34</sup> is important to determine whether an individual is at risk of HIV and would be suitable for post-exposure prophylaxis (PEP). There are continuing challenges of measuring PrEP adherence, as simple measures such as medication possession ratio or self-reported adherence may not adequately capture effective use of ED-PrEP. For example, self-reported adherence for daily PrEP may ask patients if they missed more than one or two doses a week such that those who did not miss more than one dose could be considered adherent.<sup>35</sup> However, self-reported adherence to ED-PrEP relies on the patient's memory of the specific timing of recent sexual events and pill-taking,<sup>36</sup> and may require good understanding of ED-PrEP for patients to determine if their sexual events were 'covered' by ED-PrEP or not. As our results found, more than half of participants still did not know how to take ED-PrEP correctly, developing innovative ways to measure prevention-effective adherence among GBM who take ED-PrEP (particularly those with incorrect knowledge) should become a priority in PrEP monitoring.<sup>1</sup>

There are several limitations to this analysis. As the survey was cross-sectional, it is not possible to determine that the PrEP social marketing campaigns caused increased PrEP and ED-PrEP awareness or correct knowledge. Participants may have become aware of ED-PrEP through other avenues, including discussing ED-PrEP with a clinician or finding information online about ED-PrEP. Although previous experience with PrEP was strongly associated with higher ED-PrEP awareness and correct knowledge of how to take it, the underlying mechanism between this association is unclear. For example, those who have used PrEP may be more likely to seek out or be exposed to ED-PrEP information, but conversely, those who are exposed to ED-PrEP information or general PrEP information may be more likely to initiate PrEP. As this was advertised as a PrEP survey, participants who completed the survey may not be representative of GBM, as this group is likely to care about PrEP, which limits the generalisability of our results.

## Conclusion

Increasing both awareness and knowledge of ED-PrEP, as well as new emerging forms of PrEP, should remain a priority in HIV prevention. As daily PrEP may not be suitable for everyone, it is important to empower individuals with greater choice of HIV prevention methods that suits their needs. However, as awareness of alternatives to daily oral PrEP increases, correct knowledge of how to effectively use these alternatives is crucial for informed decision-making so that individuals remain protected from HIV. Continued work in assessing awareness and knowledge of ED-PrEP, and PrEP more broadly, is needed to achieve the elimination of HIV transmission both in Australia and globally.

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**Data availability.** The data that support this study cannot be publicly shared due to ethical or privacy reasons and may be shared upon reasonable request to the corresponding author if appropriate.

**Conflicts of interest.** Andrew E. Grulich is a Joint Editor of *Sexual Health*, but was blinded from the peer-review process for this paper.

**Declaration of funding.** This study was funded by ACON and the Department of Health and Aging.

**Acknowledgements.** We thank all the participants for completing the survey. Survey recruitment was conducted with support from ACON.

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