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3 **Reasons for not using HIV PrEP and strategies that may facilitate HIV PrEP uptake in Ontario and**
4 **British Columbia among gay, bisexual and other men who have sex with men**
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ABSTRACT

Background

HIV Pre-exposure prophylaxis (PrEP) is underutilized. We aimed to identify barriers to PrEP use and strategies that may facilitate its uptake.

Methods

Gay, bisexual and other men who have sex with men 19 years or older living in Ontario and British Columbia, Canada, completed a cross-sectional survey in 2019/2020. Participants who met Canadian PrEP guideline criteria and not already using PrEP identified relevant barriers and which strategies would make them more likely to start PrEP. We described such barriers and strategies separately for Ontario and British Columbia.

Results

Of 1527 survey responses, 261 who never used PrEP and met criteria for PrEP were included. In Ontario, the most common barriers were affordability (43%) and concern about side effects (42%). In British Columbia, the most common reasons were concern about side effects (41%) and not feeling at high enough risk (36%). In Ontario, preferred strategies were: short waiting time (63%), the healthcare provider informing about their HIV risk being higher than perceived (62%) and a written step-by-step guide (60%). In British Columbia, strategies were: short waiting time (68%), people speaking publicly about PrEP (68%) and their healthcare provider counselling about: their HIV risk being higher than perceived (64%), side effects of PrEP (65%) and about how well PrEP works (62%).

Conclusions

Concern about side effects and not self-identifying as high risk for HIV were common barriers. Shorter waiting times may increase PrEP uptake. In Ontario, the findings suggested lack of affordability. In British Columbia, strategies involving healthcare providers were valued.

Key words: HIV Pre-exposure prophylaxis, prevention, men who have sex with men, gender and sexual minorities, accessibility of health services.

INTRODUCTION

HIV pre-exposure prophylaxis (PrEP) using tenofovir disoproxil fumarate/emtricitabine (TDF/FTC) is highly effective at reducing the risk of HIV infection[1-3] and has been approved for daily use in Canada since 2016. However, despite a significant increase in the number of PrEP users in the past years[4, 5], that is still far below the estimated number of people who could benefit from PrEP.[6, 7] Barriers to PrEP uptake exist at the individual, interpersonal, community and structural level.[8] At the individual level, lack of awareness, perceived lack of efficacy, concern about side effects and low HIV risk perception are common. At the interpersonal level, there is fear of risk compensation (increase in risk-taking behaviors as a result of a decrease in perceived risk) and stigma from peers, family and friends. At the community level, barriers include mistrust of the pharmaceutical industry and medical establishment, and inadequate access to health care providers experienced in working with sexual or gender minorities. In addition, providers' lack of awareness or training, lack of referral pathways, concern about risk compensation, and concern about patient adherence can be barriers.[9, 10] Finally, at the structural level, issues of affordability as it is the case in Ontario where PrEP is not fully funded, institutionalized racism/discrimination and structural stigma play a major role in the disparate access to and limited uptake of PrEP. [8, 11-18]

All such barriers are potentially modifiable, with some requiring more individual-focused actions such as education/health promotion with individuals whom could benefit from PrEP, and others operating at the policy level such as full public funding for PrEP. To decide what methods and strategies could help individuals at risk of HIV access PrEP, it is necessary to describe the key determinants and/or the barriers to access and use. Relevant methods could be empowerment, improving perceived relevance, influencing the reference group or redesign of services[19-21]; and the strategies that can translate such methods into actions include counselling, peer education, information provision, having role models, and the availability of guides, among others.[19-21] An important component of such intervention planning is to consider end users' (in this case, potential PrEP users) preferences regarding what strategies might have an impact on their decision to initiate PrEP. The aims of this analysis were to identify the barriers to PrEP use among GBM who have never used PrEP who met Canadian guideline criteria[6], to identify strategies most likely to influence GBM nonusers' decision to start PrEP and to explore differences between Ontario and British Columbia.

METHODS

The PrEP implementation project (PRIMP) is a multicomponent PrEP Implementation study investigating strategies for increasing PrEP uptake among urban GBM in Ontario and British Columbia, Canada. One component is an open voluntary cross-sectional survey, which recruited participants from: Toronto, Ottawa and Hamilton in Ontario; and Vancouver and Victoria in British Columbia. These cities were selected because they are the largest urban centers in the two largest English speaking provinces in Canada, as well as because of their differential medication coverage policies: PrEP is universally covered in British Columbia but not in Ontario. Potential participants were recruited via various means, including English-language posters and information cards distributed in sexual health clinics, advertisements on popular GBM dating apps, and via social media (Facebook and dating apps) promotion by collaborating community organizations. Responses were automatically stored into a database and questions were adapted based on responses to other items.

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3 Inclusion criteria were being age 19 years or older, identifying as cisgender man, transgender man or
4 transgender woman, being able to communicate in English, reported MSM sexual behavior in the past
5 six months and provided consent. Volunteers or employees of any community health services
6 organization were excluded. Recruitment took place between July 2019 and August 2020.
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9 The survey included questions about sociodemographic variables and sexual health. The survey was
10 previously tested for usability and technical functionality, and allowed to navigate back and forth. Self-
11 reported sexual health variables as per the Canadian guideline criteria for PrEP[6] were asked to
12 determine PrEP eligibility for the present analysis. Such criteria consist of condomless anal sex in the
13 past six months plus any of the following: infectious syphilis, rectal gonorrhoea, rectal chlamydia,
14 repeated use of non-occupational post-exposure prophylaxis [nPEP], or scoring ≥ 11 on the High
15 Incidence Risk Index for Men Who Have Sex with Men (HIRI-MSM)[22]. We did not collect information
16 about the viral load status of respondents' partners who were living with HIV. We also asked never PrEP
17 users about their reasons for not using PrEP and what strategies would influence their decision to start
18 PrEP from a list of possible barriers and strategies respectively, based on previous experience working
19 with GBM trying to access PrEP (see appendix 1).
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23 Data are presented for the entire study sub-sample and stratified by province. For continuous variables,
24 mean and standard deviation or median and interquartile range are presented depending on their
25 distribution. Categorical data are presented as proportions. We analyzed all available data. Differences
26 between provinces were tested using the Chi-square or Fisher's exact test for categorical variables, or
27 with t-tests or Wilcoxon rank-sum tests for continuous variables. We did post-hoc analyses to explore
28 the reasons for not using PrEP and the strategies to increase PrEP uptake stratified by level of formal
29 education and ethnicity. Examining these subgroups is relevant considering differential HIV rates and
30 PrEP uptake in Canada and in other settings, as data shows that Black, Latinx and indigenous are at a
31 more disadvantaged position.[23-26]
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35 Sample size for the overall PRIMP survey was calculated based on previous surveys on PrEP awareness,
36 acceptability and usage[27, 28]. This resulted in a sample size of 250 participants in each city (1250 in
37 total) to estimate these proportions with adequate precision. However, the present analyses include
38 only never PrEP users who meet criteria for PrEP according to the Canadian PrEP guideline.[6] This study
39 was reviewed and approved by the Research Ethics Boards of Clinical Trials Ontario, Unity Health
40 Toronto, University Health Network, Toronto Public Health, University of Toronto, York Region,
41 University of British Columbia and University of Victoria. (REB 18-346). Study data are securely stored at
42 password protected server at St. Michael's Hospital in Toronto. Participants were offered a \$10 CAD gift
43 card as compensation for their time.
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48 RESULTS

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50 In total, 260 participants were included in this analysis; 184 from Ontario and 76 from British Columbia
51 (Figure 1). The median age was 31 years (IQR: 26-38) and 61% had at least a Bachelor's degree. In both
52 provinces, most were White (57%). Private drug insurance (59%) and out of pocket (27%) were the most
53 common forms of paying for medications (Table 1).
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7 Descriptive and comparative analyses of PrEP eligibility are shown in Table 2. Participants were PrEP
8 eligible based on a prior bacterial STI diagnosis (syphilis, rectal gonorrhoea and/or rectal chlamydia) in 99
9 (38% of the sample), prior recurrent PEP use in 15 (6%), and HIRI score ≥ 11 in 256 (98%).

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11 -TABLE 2-

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13 In Ontario, the most common reasons for not using PrEP was cost (43%), unlike BC where cost was
14 reported as a barrier by 16% ($p < 0.001$) (Table 3). Other common reasons were: concern about side
15 effects (42% in Ontario and 41% in BC) and not feeling at high enough risk (27% in Ontario and 36% in
16 BC). Unwillingness to take a pill regularly was also common in BC (24%) (Table 3).

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18 -TABLE 3-

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20 Strategies that might influence participants' decision to start PrEP are shown in table 4. In Ontario, these
21 were short waiting time (63%), healthcare providers informing them about their HIV risk being higher
22 than perceived (62%) and a written step-by-step guide on how to access PrEP (60%). In British Columbia,
23 these were short waiting time (68%), people speaking publicly about PrEP (68%) and their healthcare
24 provider counselling them about: their HIV risk being higher than perceived (64%), side effects of PrEP
25 (65%) and about how well PrEP works (62%).

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27 -TABLE 4-

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29 In the post-hoc analyses, being unable to afford PrEP was more common among participants with less
30 than a Bachelor's degree (43%) compared with those with at least a Bachelor's degree (31%, $p=0.049$).
31 In contrast, not feeling at high enough risk was less common (21% vs 34%, $p: 0.019$). (Table S1).
32 Likewise, Latinx, South Asian and Middle Eastern indicated affordability as one of the main barriers for
33 PrEP uptake slightly more often than other groups ($p: 0.052$). Furthermore, participants with less than a
34 Bachelor's degree were less likely to identify any of the listed reasons (see table 4) as strategies that
35 would influence their decision to start PrEP (Table S2).

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39 **DISCUSSION**

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41 In this community-based sample of GBM in five large cities in Ontario and British Columbia, we found
42 that a third of those meeting evidence-based criteria for PrEP initiation had never used it. Concern about
43 side effects, affordability and not feeling at high enough risk were the most common barriers to PrEP
44 uptake. Short waiting time was the most preferred strategy to increase PrEP uptake; other strategies
45 included healthcare providers informing clients about their HIV risk being higher than perceived,
46 counselling side effects of PrEP and about how well PrEP works; written guides; and people speaking
47 publicly about PrEP. The largest observed difference between the provinces was affordability as a
48 reason for not using PrEP.

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50 In Ontario, 43% of participants identified cost as a reason for not accessing PrEP (in contrast to 16% in
51 BC). While PrEP is listed on Ontario's public drug formulary, there are both administrative and financial
52 barriers to accessing this formulary[29], such that only 23% of PrEP users in the province access it
53 through this mechanism[4]. In contrast, in British Columbia, PrEP is publicly funded if clinical criteria
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3 based on the Canadian guideline for PrEP are met,[30] making it one of only a few provinces/territories
4 in Canada where PrEP is fully funded.[30-33] Nevertheless, affordability was cited as a barrier to PrEP
5 uptake in 16% of British Columbia respondents, possibly due to reasons related to immigration status,
6 costs associated with accessing the medication (e.g. travel) or inter-provincial portability policies.
7 Universal PrEP access across Canada is urgently required to address this fundamental barrier to health
8 equity.
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11 Concern about side effects was the most common reason for not using PrEP in the overall sample. This
12 finding suggests that more public education is required regarding PrEP's generally favourable side effect
13 profile, perhaps emphasizing that the most common regimen of PrEP, TDF/FTC, does not carry a risk of
14 serious adverse events higher than placebo. [1-3] in this regard, the main tolerability issue associated
15 with PrEP is gastrointestinal upset which tends to be mild and resolves spontaneously within the first
16 month.[34] In addition, although more long-term data are needed, it is known the asymptomatic renal
17 and bone toxicities of FTC-TDF include slight elevations in creatinine and modest decreases in bone
18 mineral density that are generally reversible with drug discontinuation, and can generally be monitored
19 and managed clinically.[1, 34-37] The side effect profile is similar for on demand FTC-TDF (two pills prior
20 to sexual activity and one pill per day for two days after).[3] Furthermore, a more recent form of PrEP,
21 Emtricitabine and tenofovir alafenamide (TAF-FTC) has shown a slightly better safety profile than FTC-
22 TDF in terms of creatinine levels and bone density.[2] While concerns about side effects might be
23 mitigated by providing more information about PrEP, the collective memory of side effects related to
24 HIV treatment and medical mistrust might be important contributing factors to such concerns.[15, 16]
25 Creative interventions that go beyond traditional patient education may thus be needed to overcome
26 these barriers.
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31 Not feeling at high enough risk was common among the study participants. While some of the non-users
32 are in fact at low risk of HIV infection, including those in monogamous relationships or in those with
33 consistent condom use,[6, 38] many GBM may underestimate their risk.[6] This misalignment between
34 the potential user's and the clinician's perspectives has been previously described in the literature as
35 one of the main barriers to PrEP uptake,[39] but requires deeper study.
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38 Participants in both provinces reported that short waiting times might increase their chances of starting
39 PrEP. Our data shows that the median waiting time from the moment a person decides to go on PrEP
40 until they get a prescription ranges between seven days and two months.[40] Further, potential users
41 might feel discouraged if they cannot access PrEP directly from their primary care provider, especially if
42 there is already some hesitancy to start PrEP. While not without limitations, interventions such as
43 telemedicine or decentralization of access to PrEP through engagement of other healthcare
44 professionals, pharmacists, HIV testing sites or community organizations could reduce waiting times.[41]
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47 In British Columbia, a large proportion of participants reported that having their healthcare provider
48 informing them about how well PrEP works, counselling them about side effects and informing them
49 about their HIV risk being higher than perceived would positively influence their decision to start PrEP.
50 The latter was also commonly reported in Ontario. This indicates that strategies aiming to improve PrEP
51 uptake must engage health care providers. Importantly, informing high-risk MSM of their calculated risk
52 as a stand-alone intervention rather than in the context of a visit to a provider, is not sufficient to
53 increase PrEP uptake[42], suggesting that successful strategies should be multicomponent. Providers
54 should follow a personalized approach: acknowledge patient's sexual behaviors, assess and address
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3 potential users' concerns, come up with a joint risk-reduction plan, and provide follow-up. Short
4 interventions containing some of these elements have been associated with an increase in providers'
5 abilities to discuss HIV prevention at HIV clinics.[43] If written guides about accessing PrEP are used,
6 information about how HIV risk is assessed and when an individual should consider PrEP could be
7 included. Our findings indicated the need for more innovative social marketing strategies. People
8 speaking publicly about PrEP, and messaging about PrEP on social media and other channels using digital
9 platforms could perhaps include information about risk self-assessment too.
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12 In the post-hoc analyses, we observed signs of disparities depending on level of formal education and
13 ethnicity. Latinx, south Asian and Middle Eastern reported cost as a barrier more often than other ethnic
14 groups and more often than other barriers. Furthermore, those with education levels lower than a
15 Bachelor's degree reported lower acceptability of almost all listed strategies to influence their decision
16 to start PrEP.
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19 Our study has limitations. Our findings may not be generalizable to smaller urban centers or rural areas,
20 where other types of barriers may be more relevant. However, introducing universally funded PrEP for
21 eligible individuals may result in increased PrEP uptake in both urban and rural areas, considering that
22 affordability was selected as one of the main barriers. Similarly, short waiting times and healthcare
23 providers able to inform about different aspects of PrEP might also have a positive effect in various
24 settings. In addition, participants were recruited from sexual health clinics and through advertisements
25 on specific internet platforms, meaning that our results might not be representative of people not
26 engaged in care and/or less active on social media, who possibly experience more difficulties accessing
27 PrEP or information about PrEP. We do not believe that providing compensation for participating in the
28 survey had a large influence on the final sample as we do not believe the honorarium provided had an
29 important impact on accepting risks derived from taking the survey that they would not have accepted
30 otherwise. Finally, our study was not sufficiently powered to identify differences between subgroups;
31 however, we observed indications of differences in the role of affordability based on ethnicity and
32 acceptability of strategies to increase PrEP uptake based on level of formal education.
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39 **CONCLUSIONS**

40 Concern about side effects and not feeling at high enough risk were common barriers in both provinces.
41 In Ontario, the findings suggested structural issues such as affordability and accessibility. In British
42 Columbia, strategies involving healthcare providers were often valued. Future interventions must
43 consider barriers on various levels, including potential users' knowledge and attitudes towards PrEP, the
44 capacity of healthcare providers to provide information and prescribe PrEP and what policies for
45 medication coverage are in place.
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55 and is now home to many diverse First Nations, Inuit and Métis peoples.
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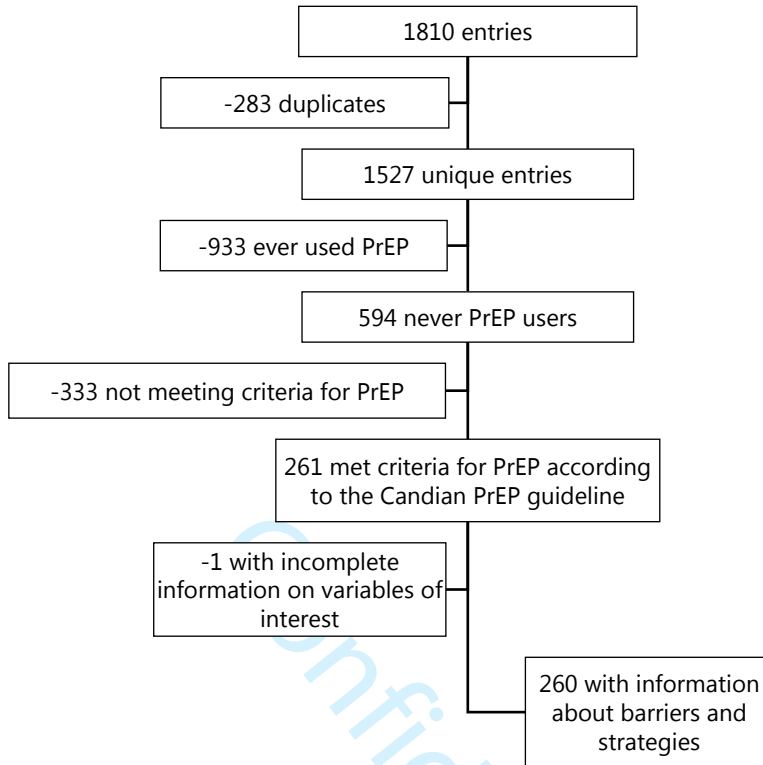
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Confidential

Figure 1. Flowchart of survey participants.



Confidential

Table 1. Sociodemographic characteristics of all the study participants and stratified by province.

	All		Ontario		British Columbia		p-value
Age, median(IQR)	31 (26-38)		31 (26-37)		32 (27-40)		0.405
19-28	94	36%	68	37%	26	35%	
29-40	116	45%	85	46%	31	41%	
41-48	25	10%	15	8%	10	13%	
>=49	24	9%	16	9%	8	11%	
Total	259		184		75		
Ethnicity							0.002*
White	147	57%	105	57%	42	55%	
Black	15	6%	15	8%	0	0%	
Indigenous people of Canada	8	3%	5	3%	3	4%	
East Asian	22	8%	9	5%	13	17%	
Southeast Asian	18	7%	9	5%	9	12%	
South Asian	7	3%	6	3%	1	1%	
Middle Eastern	11	4%	9	5%	2	3%	
Latinx	22	8%	18	10%	4	5%	
Others	10	4%	8	4%	2	3%	
Total	260		184		76		
Place of birth							0.345
Born in Canada	172	66%	125	68%	47	62%	
Born outside of Canada	88	34%	59	32%	29	38%	
Total	260		184		76		
Education							
High school or less	27	11%	20	11%	7	9%	0.116
College/technical	73	28%	46	25%	27	36%	
Bachelor's degree	102	40%	80	44%	22	29%	
Postgraduate degree	55	21%	36	20%	19	25%	
Total	257		182		75		
Annual Personal Income (CAD)							
20.000 or less	31	12%	24	13%	7	9%	0.789
20.001-40.000	55	21%	41	22%	14	18%	
40.001-60.000	75	29%	50	27%	25	33%	
60.001-80.000	44	17%	29	16%	15	20%	
More than 80.000	37	14%	26	14%	11	15%	
Prefers not to answer	17	7%	13	7%	4	5%	
Total	259		183		76		
Gender							

Man	250	97%	177	97%	73	96%	0.878*
Woman	4	1%	3	2%	1	1%	
Two-Spirit	1	1%	1	1%	0	0%	
Gender Fluid	4	1%	2	1%	2	3%	
Total	259		183		76		
Relationship status							
No regular partner	125	49%	85	47%	40	53%	0.872*
Open relationship	93	36%	68	38%	25	33%	
Closed relationship	29	11%	21	12%	8	11%	
Prefers not to answer	10	4%	7	4%	3	4%	
Total	257		181		76		
Primary Care Provider							
Yes	163	63%	124	67%	39	51%	0.040*
No	90	35%	56	30%	34	45%	
Prefers not to answer	7	3%	4	2%	3	4%	
Total	260		184		76		
How pays for medications							
Private	153	59%	110	60%	43	57%	0.162*
IFHP-refugees†	1	1%	0	0%	1	1%	
NIHB-indigenous‡	5	2%	2	1%	3	4%	
BC Pharmacare	1	1%	0	0%	1	1%	
Ontario Drug Benefit	20	8%	17	9%	3	4%	
Out of pocket	71	27%	48	26%	23	30%	
Other	1	1%	1	1%	0	0%	
Prefers not to answer	7	3%	5	3%	2	3%	
Total	259		183		76		

*Fisher's exact test. †IFHP: Interim Federal Health Program. ‡NIHB: Non-insured health benefits for First Nations people and Inuit.

Table 2. HIRI score, STIs, use of PEP and self-perceived risk of HIV for all included study participants and stratified by province. Figures sum to >100% due to many participants meeting multiple criteria.

	All		Ontario		British Columbia	p-value
HIRI score, mean (SD)	20.5 (6.5)		21.0 (6.4)		19.4 (6.6)	0.066
Total	260		184		76	
Syphilis						0.381
Yes	59	30%	40	28%	19	35%
No	138	70%	102	72%	36	65%
Total	197		142		55	
Rectal chlamydia						0.843
Yes	36	17%	25	17%	11	18%
No	173	83%	123	83%	50	82%
Total	209		148		61	
Rectal gonorrhea						0.426
Yes	40	19%	31	20%	9	15%
No	174	81%	124	80%	50	85%
Total	214		155		59	
PEP more than once						0.413
Yes	15	6%	12	7%	3	4%
No	244	94%	171	93%	73	96%
Total	259		183		76	

Table 3. Reasons for not using PrEP for all study participants and stratified by province.

	All		Ontario		British Columbia		p-value
	n	%	n	%	n	%	
Concern about side effects	108	41%	77	42%	31	41%	0.875
Unable to afford it	92	35%	80	43%	12	16%	<0.001
Not feeling at high enough risk	76	29%	49	27%	27	36%	0.151
Unwillingness to take a pill regularly	65	25%	47	26%	18	24%	0.753
Lack of knowledge about where to get it	64	25%	48	26%	16	21%	0.391
Lack of protection against other STIs	50	19%	36	20%	14	18%	0.831
Consistent condom use for anal sex	33	13%	20	11%	13	17%	0.17
Concern about what others would think	32	12%	25	14%	7	9%	0.329
No particular reason	22	8%	17	9%	5	7%	0.483
Other*	18	7%	9	5%	9	12%	0.045
Belief that PrEP is not effective enough	11	4%	8	4%	3	4%	0.884
The HCP wouldn't prescribe it	10	4%	5	3%	5	7%	0.141
Lack of interest	8	3%	5	3%	3	4%	0.601
Total participants	260		184		76		

*Other reasons included: the process to getting PrEP is too complicated, busy schedule, no or infrequent anal sex, being monogamous, privacy issues, being told that they are not at high enough risk, among others.

Table 4. Strategies that would more likely influence the decision to start PrEP for all participants and stratified by province.

Strategies that might influence the decision to start PrEP	All participants		Ontario		British Columbia		p-value
	n	%	n	%	n	%	
Short waiting time to PrEP appointment	160	65%	114	63%	46	68%	0.526
HCP informing about being at higher risk than perceived	155	63%	111	62%	44	64%	0.837
Written step-by-step guide	152	61%	109	60%	43	61%	0.861
People speaking publicly about PrEP	147	59%	101	56%	46	68%	0.099
HCP informing about how well PrEP works	144	58%	101	57%	43	62%	0.425
Help finding publicly funded PrEP	142	57%	103	58%	39	57%	0.884
A list of PrEP providers	140	57%	99	56%	41	59%	0.588
HCP counselling about side effects	136	55%	92	51%	44	65%	0.055
People disclosing their PrEP use on apps	138	55%	97	54%	41	60%	0.343
A navigator to find providers	128	51%	91	51%	37	53%	0.774
An online program to calculate risk	124	50%	90	51%	34	49%	0.856
A publicity campaign promoting PrEP	118	48%	84	47%	34	51%	0.568
Information to bring to their HCP	94	38%	60	34%	34	50%	0.020

Table S1 and S2. Reasons for not using PrEP stratified by level of formal education and by ethnicity.

Reasons for not using PrEP	Less than Bachelor's		More than Bachelor's		p-value
	n	%	n	%	
Concern about side effects	43	43%	65	41%	0.755
Unable to afford it	43	43%	49	31%	0.049
Unwillingness to take a pill regularly	25	25%	40	25%	0.964
Lack of knowledge about where to get it	25	25%	39	24%	0.945
Not feeling at high enough risk	21	21%	55	34%	0.019
Consistent condom use for anal sex	16	16%	17	11%	0.217
Lack of protection against other STIs	14	14%	36	23%	0.084
No particular reason	12	12%	10	6%	0.111
Concern about what others would think	8	8%	24	15%	0.089
The HCP wouldn't prescribe it	5	5%	5	3%	0.454
Belief that PrEP is not effective enough	4	4%	7	4%	0.871
Other	3	3%	15	9%	0.047
Lack of interest	2	2%	6	4%	0.419

Reasons for not using PrEP	White	Black	Indigenous	East Asian	South East Asian	South Asian	Middle Eastern	Latinx	Other	p-value
Unable to afford it	52 (35%)	5 (33%)	1 (13%)	4 (18%)	3 (17%)	4 (57%)	6 (55%)	12 (55%)	5 (50%)	0.052
Unwillingness to take a pill regularly	43 (29%)	5 (33%)	1 (13%)	6 (27%)	0 (0%)	2 (29%)	1 (9%)	5 (23%)	2 (20%)	0.148
Lack of knowledge about where to get it	37 (25%)	4 (27%)	1 (13%)	6 (27%)	5 (28%)	2 (29%)	2 (18%)	4 (18%)	3 (30%)	0.989
Not feeling at high enough risk	50 (34%)	2 (13%)	2 (25%)	8 (36%)	4 (22%)	1 (14%)	4 (36%)	4 (18%)	1 (10%)	0.435
Consistent condom use for anal sex	21 (14%)	4 (27%)	1 (13%)	2 (9%)	3 (17%)	1 (14%)	0 (0%)	1 (5%)	0 (0%)	0.486
Lack of protection against other STIs	31 (21%)	2 (13%)	3 (38%)	5 (23%)	2 (11%)	1 (14%)	1 (9%)	3 (14%)	2 (20%)	0.856
No particular reason	18 (12%)	0 (0%)	1 (13%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	2 (9%)	1 (10%)	0.360
Concern about what others would think	19 (13%)	3 (20%)	3 (38%)	1 (5%)	1 (6%)	2 (29%)	0 (0%)	1 (5%)	2 (20%)	0.113
The HCP wouldn't prescribe it	6 (4%)	0 (0%)	0 (0%)	1 (5%)	0 (0%)	1 (14%)	0 (0%)	2 (9%)	0 (0%)	0.622
Belief that PrEP is not effective enough	6 (4%)	1 (7%)	0 (0%)	2 (9%)	1 (6%)	1 (14%)	0 (0%)	0 (0%)	0 (0%)	0.542
Other	11 (7%)	1 (7%)	0 (0%)	2 (9%)	3 (17%)	0 (0%)	1 (9%)	0 (0%)	0 (%)	0.658

1	Lack of interest	5 (3%)	0 (0%)	0 (0%)	1 (5%)	0 (0%)	1 (14%)	1 (9%)	0 (0%)	0 (0%)	0.483
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Table S3 and S4. Strategies that might influence the decision to start PrEP stratified by level of formal education and by ethnicity.

8	Strategies that might influence the decision to start PrEP	Less than Bachelor's	Bachelor's degree or higher	p-value		
10	Short waiting time to PrEP appointment	53	56%	107	70%	0.024
11	Written step-by-step guide	52	54%	100	65%	0.074
12	A navigator to find providers	52	54%	76	50%	0.579
14	HCP informing about being at higher risk than perceived	49	52%	106	69%	0.007
16	HCP informing about how well PrEP works	49	52%	95	62%	0.123
18	People speaking publicly about PrEP	49	52%	98	64%	0.074
19	People disclosing their PrEP use on apps	49	52%	89	58%	0.338
21	Help finding publicly funded PrEP	44	47%	98	64%	0.009
22	HCP counselling about side effects	44	47%	92	60%	0.047
24	A list of PrEP providers	45	46%	95	63%	0.009
25	An online program to calculate risk	41	44%	83	54%	0.105
27	A publicity campaign promoting PrEP	41	43%	77	51%	0.251
28	Information to bring to their HCP	31	33%	63	42%	0.142

33	Strategies that might influence the decision to start PrEP	White	Black	Indigenous	East Asian	South East Asian	South Asian	Middle Eastern	Latinx	Other	p-value
35	Short waiting time to PrEP appointment	89 (64%)	9 (64%)	4 (67%)	14 (67%)	13 (72%)	6 (86%)	5 (45%)	15 (71%)	5 (50%)	0.781
36	Written step-by-step guide	83 (59%)	9 (64%)	4 (57%)	12 (55%)	14 (78%)	3 (43%)	7 (64%)	15 (68%)	5 (50%)	0.780
37	A navigator to find providers	67 (48%)	7 (50%)	3 (43%)	15 (68%)	12 (67%)	4 (57%)	3 (27%)	12 (57%)	5 (50%)	0.445
38	HCP informing about being at higher risk than perceived	83 (61%)	11 (73%)	2 (29%)	16 (73%)	13 (72%)	5 (71%)	7 (64%)	13 (65%)	5 (50%)	0.570
40	HCP informing about how well PrEP works	75 (55%)	9 (60%)	2 (29%)	17 (77%)	13 (72%)	4 (57%)	4 (36%)	14 (67%)	6 (60%)	0.227

1	People speaking publicly about PrEP	81 (59%)	6 (40%)	4 (57%)	14 (64%)	13 (76%)	3 (43%)	6 (60%)	14 (64%)	6 (60%)	0.698
2	People disclosing their PrEP use on apps	74 (54%)	7 (47%)	5 (71%)	13 (59%)	14 (78%)	4 (57%)	5 (45%)	13 (59%)	3 (30%)	0.413
3	Help finding publicly funded PrEP	75 (54%)	6 (46%)	3 (43%)	17 (77%)	12 (71%)	6 (86%)	5 (45%)	14 (64%)	4 (40%)	0.188
4	HCP counselling about side effects	68 (49%)	8 (53%)	1 (17%)	15 (71%)	14 (82%)	6 (86%)	6 (55%)	12 (55%)	6 (60%)	0.042
5	A list of PrEP providers	77 (55%)	9 (64%)	2 (29%)	15 (68%)	10 (59%)	5 (71%)	6 (60%)	11 (52%)	5 (56%)	0.805
6	An online program to calculate risk	60 (44%)	8 (53%)	3 (43%)	9 (41%)	13 (72%)	6 (86%)	7 (64%)	14 (67%)	4 (40%)	0.095
7	A publicity campaign promoting PrEP	59 (43%)	8 (53%)	5 (71%)	11 (50%)	12 (71%)	4 (57%)	4 (36%)	11 (52%)	4 (40%)	0.457
8	Information to bring to their HCP	39 (29%)	9 (60%)	3 (43%)	10 (48%)	11 (61%)	4 (67%)	3 (27%)	14 (64%)	1 (11%)	0.001

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14 Appendix 1. Survey questions.

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16 Were any of the following part of the reason that you have never used PrEP? (check all that apply)

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- 18 • I'm worried about side effects
- 19 • I didn't know where to get it
- 20 • I couldn't afford the medication cost
- 21 • I was diagnosed with HIV
- 22 • The healthcare provider I went to would not prescribe it to me
- 23 • I didn't feel I was at high enough risk for HIV
- 24 • I was worried about what others would think about me taking PrEP
- 25 • I don't think it is effective enough at preventing HIV
- 26 • It does not prevent other STIs
- 27 • I don't want to take a pill regularly
- 28 • I always use condoms for anal sex
- 29 • I can't be bothered
- 30 • No, there is no particular reason that I have never used PrEP
- 31 • Other reason (describe): _____

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37 How would each of these things change how likely you are to go onto PrEP?

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	This would make me LESS likely to go on PrEP	This would not change how likely I am to go on PrEP	This would make me MORE likely to go on PrEP
a. Information I could bring to my doctor to help them learn about PrEP.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
b. A list of other providers in my area that prescribe PrEP.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
c. A short waiting time for my first PrEP appointment.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
d. A written step-by-step guide to going onto PrEP.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
e. Someone working with me to find a provider that prescribes PrEP.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
f. Someone working with me to access the publicly funded PrEP program in my province.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
g. An online program that allows me to calculate my risk of HIV.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
h. A healthcare provider telling me that my risk for HIV is higher than I thought.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
i. A healthcare provider counselling me in detail about how well PrEP works.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
j. A healthcare provider counselling me in detail about the risk of PrEP side effects.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
k. A publicity campaign in my community promoting PrEP as a responsible choice.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
l. More people in my community speaking publicly about their experiences taking PrEP.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
m. More people on social media and hookup apps disclosing that they are on PrEP.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Confidential

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3 **Reasons for not using HIV PrEP and strategies that may facilitate HIV PrEP uptake in Ontario and**
4 **British Columbia among gay, bisexual and other men who have sex with men**
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ABSTRACT

Background

HIV Pre-exposure prophylaxis (PrEP) is underutilized. We aimed to identify barriers to PrEP use and strategies that may facilitate its uptake.

Methods

Gay, bisexual and other men who have sex with men 19 years or older living in Ontario and British Columbia, Canada, completed a cross-sectional survey in 2019/2020. Participants who met Canadian PrEP guideline criteria and not already using PrEP identified relevant barriers and which strategies would make them more likely to start PrEP. We described such barriers and strategies separately for Ontario and British Columbia.

Results

Of 1527 survey responses, 261 who never used PrEP and met criteria for PrEP were included. In Ontario, the most common barriers were affordability (43%) and concern about side effects (42%). In British Columbia, the most common reasons were concern about side effects (41%) and not feeling at high enough risk (36%). In Ontario, preferred strategies were: short waiting time (63%), the healthcare provider informing about their HIV risk being higher than perceived (62%) and a written step-by-step guide (60%). In British Columbia, strategies were: short waiting time (68%), people speaking publicly about PrEP (68%) and their healthcare provider counselling about: their HIV risk being higher than perceived (64%), side effects of PrEP (65%) and about how well PrEP works (62%).

Conclusions

Concern about side effects and not self-identifying as high risk for HIV were common barriers. Shorter waiting times may increase PrEP uptake. In Ontario, the findings suggested lack of affordability. In British Columbia, strategies involving healthcare providers were valued.

Key words: HIV Pre-exposure prophylaxis, prevention, men who have sex with men, gender and sexual minorities, accessibility of health services.

INTRODUCTION

HIV pre-exposure prophylaxis (PrEP) using tenofovir disoproxil fumarate/emtricitabine (TDF/FTC) is highly effective at reducing the risk of HIV infection[1-3] and has been approved for daily use in Canada since 2016. However, despite a significant increase in the number of PrEP users in the past years[4, 5], that is still far below the estimated number of people who could benefit from PrEP.[6, 7] Barriers to PrEP uptake exist at the individual, interpersonal, community and structural level.[8] At the individual level, lack of awareness, perceived lack of efficacy, concern about side effects and low HIV risk perception are common. At the interpersonal level, there is fear of risk compensation (increase in risk-taking behaviors as a result of a decrease in perceived risk) and stigma from peers, family and friends. At the community level, barriers include mistrust of the pharmaceutical industry and medical establishment, and inadequate access to health care providers experienced in working with sexual or gender minorities. In addition, providers' lack of awareness or training, lack of referral pathways, concern about risk compensation, and concern about patient adherence can be barriers.[9, 10] Finally, at the structural level, issues of affordability as it is the case in Ontario where PrEP is not fully funded, institutionalized racism/discrimination and structural stigma play a major role in the disparate access to and limited uptake of PrEP. [8, 11-18]

All such barriers are potentially modifiable, with some requiring more individual-focused actions such as education/health promotion with individuals whom could benefit from PrEP, and others operating at the policy level such as full public funding for PrEP. To decide what methods and strategies could help individuals at risk of HIV access PrEP, it is necessary to describe the key determinants and/or the barriers to access and use. Relevant methods could be empowerment, improving perceived relevance, influencing the reference group or redesign of services[19-21]; and the strategies that can translate such methods into actions include counselling, peer education, information provision, having role models, and the availability of guides, among others.[19-21] An important component of such intervention planning is to consider end users' (in this case, potential PrEP users) preferences regarding what strategies might have an impact on their decision to initiate PrEP. The aims of this analysis were to identify the barriers to PrEP use among GBM who have never used PrEP who met Canadian guideline criteria[6], to identify strategies most likely to influence GBM nonusers' decision to start PrEP and to explore differences between Ontario and British Columbia.

METHODS

The PrEP implementation project (PRIMP) is a multicomponent PrEP Implementation study investigating strategies for increasing PrEP uptake among urban GBM in Ontario and British Columbia, Canada. One component is an open voluntary cross-sectional survey, which recruited participants from: Toronto, Ottawa and Hamilton in Ontario; and Vancouver and Victoria in British Columbia. These cities were selected because they are the largest urban centers in the two largest English speaking provinces in Canada, as well as because of their differential medication coverage policies: PrEP is universally covered in British Columbia but not in Ontario. Potential participants were recruited via various means, including English-language posters and information cards distributed in sexual health clinics, advertisements on popular GBM dating apps, and via social media (Facebook and dating apps) promotion by collaborating community organizations. Responses were automatically stored into a database and questions were adapted based on responses to other items.

Inclusion criteria were being age 19 years or older, identifying as cisgender man, transgender man or transgender woman, being able to communicate in English, reported MSM sexual behavior in the past six months and provided consent. Volunteers or employees of any community health services organization were excluded. Recruitment took place between July 2019 and August 2020. ~~Participants were offered a \$10 CAD gift card as compensation for their time.~~

The survey included questions about sociodemographic variables and sexual health. The survey was previously tested for usability and technical functionality, ~~with the possibility and allowed~~ to navigate back and forth. ~~Self-reported sexual health variables included as per the~~ Canadian guideline criteria for PrEP[6] ~~were asked to determine PrEP eligibility for the present analysis, which for GBM, Such criteria~~ ~~are consist of~~ condomless anal sex ~~in the past six months~~ plus any of the following: infectious syphilis, rectal gonorrhea, rectal chlamydia, repeated use of non-occupational post-exposure prophylaxis [nPEP], ~~and or~~ scoring ≥ 11 on the High Incidence Risk Index for Men Who Have Sex with Men (HIRI-MSM)[22]. We did not collect information about the viral load status of respondents' partners who were living with HIV. We also asked never PrEP users about their reasons for not using PrEP and what strategies would influence their decision to start PrEP ~~from a list of possible barriers and strategies respectively, based on previous experience working with GBM trying to access PrEP (see appendix 1).~~

Data are presented for the entire study sub-sample and stratified by province. For continuous variables, mean and standard deviation or median and interquartile range are presented depending on their distribution. Categorical data are presented as proportions. We analyzed all available data. Differences between provinces were tested using the Chi-square or Fisher's exact test for categorical variables, or with t-tests or Wilcoxon rank-sum tests for continuous variables. We did post-hoc analyses to explore the reasons for not using PrEP and the strategies to increase PrEP uptake ~~for specific subgroups: those with less stratified by level of formal education than a Bachelor's degree, and those not identifying as white born in Canada and ethnicity. Examining these subgroups is relevant considering differential HIV rates and PrEP uptake in Canada and in other settings, as data shows that Black, Latinx and indigenous are at a more disadvantaged position.~~[23-26].

Sample size for the overall PRIMP survey was calculated based on previous surveys on PrEP awareness, acceptability and usage[27, 28]. This resulted in a sample size of 250 participants in each city (1250 in total) to estimate these proportions with adequate precision. However, the present analyses include only never PrEP users who meet criteria for PrEP according to the Canadian PrEP guideline.[6] This study was reviewed and approved by the Research Ethics Boards of Clinical Trials Ontario, Unity Health Toronto, University Health Network, Toronto Public Health, University of Toronto, York Region, University of British Columbia and University of Victoria. (REB 18-346). Study data are securely stored at password protected server at St. Michael's Hospital in Toronto. ~~Participants were offered a \$10 CAD gift card as compensation for their time.~~

RESULTS

In total, ~~1810 survey responses were recorded. However, 283 were excluded for not meeting the inclusion criteria or for including inconsistent data (e.g. double entries or repeated e-mail addresses). Of the remaining 1527 who initiated the questionnaire, 1181 answered the questions about barriers to PrEP use and strategies to increase uptake, and 790 met Canadian guideline criteria for PrEP; of these~~

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3 ~~790, 260 participants (33%) had never used PrEP and~~ were included in this analysis; ~~(184 from Ontario~~
4 and 76 from British Columbia (Figure 1)). The median age was 31 years (IQR: 26-38) and 61% had at least
5 a Bachelor's degree. In both provinces, ~~the largest sociocultural background reported was most were~~
6 ~~Canada-born~~ White (547%). Private drug insurance (59%) and out of pocket (27%) were the most
7 common forms of paying for medications (Table 1).
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9

10 -TABLE 1-

11 Descriptive and comparative analyses of PrEP eligibility are shown in Table 2. Participants were PrEP
12 eligible based on a prior bacterial STI diagnosis (syphilis, rectal gonorrhea and/or rectal chlamydia) in 99
13 (38% of the sample), prior recurrent PEP use in 15 (6%), and HIRI score ≥ 11 in 256 (98%).
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18 -TABLE 2-

19 In Ontario, the most common reasons for not using PrEP was cost (43%), unlike BC where cost was
20 reported as a barrier by 16% ($p < 0.001$) (Table 3). Other common reasons were: concern about side
21 effects (42% in Ontario and 41% in BC) and not feeling at high enough risk (27% in Ontario and 36% in
22 BC). Unwillingness to take a pill regularly was also common in BC (24%) (Table 3).
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25 -TABLE 3-

26 Strategies that might influence participants' decision to start PrEP are shown in table 4. In Ontario, these
27 were short waiting time (63%), healthcare providers informing them about their HIV risk being higher
28 than perceived (62%) and a written step-by-step guide on how to access PrEP (60%). In British Columbia,
29 these were short waiting time (68%), people speaking publicly about PrEP (68%) and their healthcare
30 provider counselling them about: their HIV risk being higher than perceived (64%), side effects of PrEP
31 (65%) and about how well PrEP works (62%).
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35 -TABLE 4-

36 In the post-hoc analyses, being unable to afford PrEP was more common among participants with less
37 than a Bachelor's degree (43%) compared with those with at least a Bachelor's degree (31%, $p=0.049$).
38 In contrast, not feeling at high enough risk was less common (21% vs 34%, $p: 0.019$). (Table S1).
39 Likewise, Latinx, South Asian and Middle Eastern indicated affordability as one of the main barriers for
40 PrEP uptake slightly more often than other groups ($p: 0.052$). Furthermore, participants with less than a
41 Bachelor's degree were less likely to identify any of the listed reasons (see table 4) as strategies that
42 would influence their decision to start PrEP (Table S2). ~~Participants who identified with a non-white~~
43 ~~identity or who were white and born outside of Canada were more likely to choose "having their HCP~~
44 ~~counseling them about side effects of PrEP" (62% vs 46%, $p: 0.01$) and "help finding publicly funded~~
45 ~~PrEP" (62% vs 51%, $p: 0.078$) than participants who were Canada-born White (Table S2).
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50 DISCUSSION

51 In this community-based sample of GBM in five large cities in Ontario and British Columbia, we found
52 that a third of those meeting evidence-based criteria for PrEP initiation had never used it. Concern about
53 side effects, affordability and not feeling at high enough risk were the most common barriers to PrEP
54 uptake. Short waiting time was the most preferred strategy to increase PrEP uptake; other strategies
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2
3 included healthcare providers informing clients about their HIV risk being higher than perceived,
4 counselling side effects of PrEP and about how well PrEP works; written guides; and people speaking
5 publicly about PrEP. The largest observed difference between the provinces was affordability as a
6 reason for not using PrEP.
7

8
9 In Ontario, 43% of participants identified cost as a reason for not accessing PrEP (in contrast to 16% in
10 BC). While PrEP is listed on Ontario's public drug formulary, there are both administrative and financial
11 barriers to accessing this formulary[29], such that only 23% of PrEP users in the province access it
12 through this mechanism[4]. ~~Paradoxically, therefore, many GBM who could benefit the most from PrEP,~~
13 ~~are often the least able to afford it and/or are not eligible for publicly funded drugs.~~ In contrast, in
14 British Columbia, PrEP is publicly funded if clinical criteria based on the Canadian guideline for PrEP are
15 met,[30] making it one of only a few provinces/territories in Canada where PrEP is fully funded.[30-33]
16 Nevertheless, affordability was ~~still~~ cited as a barrier to PrEP uptake in 16% of British Columbia
17 respondents, ~~possibly due to reasons related to immigration status, costs associated with accessing the~~
18 ~~medication (e.g. travel) or inter-provincial portability policies.~~ Universal PrEP access across Canada is
19 urgently required to address this fundamental barrier to health equity.
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23 Concern about side effects was the most common reason for not using PrEP in the overall sample. This
24 finding suggests that more public education is required regarding PrEP's generally favourable side effect
25 profile,[1-3] perhaps emphasizing that the most common regimen of PrEP, TDF/FTC, does not carry a
26 risk of serious adverse events higher than placebo. [1-3] ~~in this regard, ¶~~the main tolerability issue
27 associated with PrEP is gastrointestinal upset which tends to be mild and resolves spontaneously within
28 the first month.[34] ~~In addition, A~~although more long-term data are needed, it is known the
29 asymptomatic renal and bone toxicities of FTC-TDF include slight elevations in creatinine and modest
30 decreases in bone mineral density that are generally reversible with drug discontinuation, and can
31 generally be monitored and managed clinically.[1, 34-37] The side effect profile is similar for on demand
32 FTC-TDF (two pills prior to sexual activity and one pill per day for two days after).[3] Furthermore, a
33 more recent form of PrEP, Emtricitabine and tenofovir alafenamide (TAF-FTC) has shown a slightly better
34 safety profile than FTC-TDF in terms of creatinine levels and bone density.[2] While concerns about side
35 effects might be mitigated by providing more information about PrEP, the collective memory of side
36 effects related to HIV treatment and medical mistrust might be important contributing factors to such
37 concerns.[15, 16] Creative interventions that go beyond traditional patient education may thus be
38 needed to overcome these barriers.
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43 Not feeling at high enough risk was common among the study participants. While some of the non-users
44 are in fact at low risk of HIV infection, including those in monogamous relationships or in those with
45 consistent condom use,[6, 38] many GBM may underestimate their risk.[6] This misalignment between
46 the potential user's and the clinician's perspectives has been previously described in the literature as
47 one of the main barriers to PrEP uptake,[39] but requires deeper study.
48

49 ~~Our findings indicated the need for more innovative social marketing strategies. Written guides about~~
50 ~~accessing PrEP, one of the preferred strategies in Ontario, could include information about how HIV risk~~
51 ~~is assessed and when an individual should consider PrEP. In British Columbia, where having people~~
52 ~~speaking publicly about PrEP was a popular choice, messaging about PrEP on social media and other~~
53 ~~channels using digital platforms could perhaps include information about risk self-assessment too.~~
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Participants in both provinces reported that short waiting times might increase their chances of starting PrEP. ~~Unpublished data from our survey data shows that typically, a person waits between two to three weeks the median waiting time~~ from the moment ~~a person they~~ decide to go on PrEP ~~until they and~~ get a prescription ~~ranges between seven days and two months~~. [40] Further, potential users might feel discouraged if they cannot access PrEP directly from their primary care provider, especially if there is already some hesitancy to start PrEP. While not without limitations, interventions such as telemedicine or decentralization of access to PrEP through engagement of other healthcare professionals, pharmacists, HIV testing sites or community organizations could reduce waiting times. [41]

In British Columbia, a large proportion of participants reported that having their healthcare provider informing them about how well PrEP works, counselling them about side effects and informing them about their HIV risk being higher than perceived would positively influence their decision to start PrEP. The latter was also commonly reported in Ontario. This indicates that strategies aiming to improve PrEP uptake must engage health care providers. Importantly, informing high-risk MSM of their calculated risk as a stand-alone intervention rather than in the context of a visit to a provider, is not sufficient to increase PrEP uptake [42], suggesting that successful strategies should be multicomponent. Providers should follow a personalized approach: acknowledge patient's sexual behaviors, assess and address potential users' concerns, come up with a joint risk-reduction plan, and provide follow-up. Short interventions containing some of these elements have been associated with an increase in providers' abilities to discuss HIV prevention at HIV clinics. [43] If

~~Our findings indicated the need for more innovative social marketing strategies. wWritten guides about accessing PrEP are used, one of the preferred strategies in Ontario, could include information about how HIV risk is assessed and when an individual should consider PrEP could be included. In British Columbia, where having~~ Our findings indicated the need for more innovative social marketing strategies. pPeople speaking publicly about PrEP, was a popular choice and, messaging about PrEP on social media and other channels using digital platforms could perhaps include information about risk self-assessment too.

In the post-hoc analyses, ~~we observed signs of disparities depending on level of formal education and ethnicity. Latinx, south Asian and Middle Eastern reported cost as a barrier more often than other ethnic groups and more often than other barriers. we observed that our findings vary depending on sociocultural background, and particularly, education level. Of note~~ Furthermore, those with education levels lower than a Bachelor's degree reported lower acceptability of almost all listed strategies ~~that might~~ influence their decision to start PrEP, raising the question of what works best for whom.

Our study has limitations. One potential limitation of this study is that ~~Our findings may not be generalizable to smaller urban centers or other rural areas in Canada, where other types of barriers may exist be more relevant. However, it's worth highlighting that considering that affordability was one of the main barriers, introducing universally funded PrEP for eligible individuals may result in increased PrEP uptake in both urban and rural areas, considering that affordability was selected as one of the main barriers. Similarly, short waiting times and healthcare providers able to inform about different aspects of PrEP might also have a positive effect in other areas various settings. Another potential limitation is that~~ In addition, participants were recruited from sexual health clinics and through advertisements on specific internet platforms, ~~which means meaning~~ that our results might not be representative of people not engaged in care and/or less active on social media, who possibly experience more difficulties accessing PrEP or information about PrEP. We do not believe that providing compensation for

participating in the survey had a large influence on the final sample as we do not believe the honorarium provided had an important impact on accepting risks derived from taking the survey that they would not have accepted otherwise. Finally, our study was not sufficiently powered to identify differences between subgroups; however, we observed indications of differences in the role of affordability based on ethnicity and acceptability of strategies to increase PrEP uptake based on level of formal education.

CONCLUSIONS

Concern about side effects and not feeling at high enough risk were common barriers in both provinces. In Ontario, the findings suggested structural issues such as affordability and accessibility. In British Columbia, strategies involving healthcare providers were often valued. Future interventions must consider barriers on various levels, including potential users' knowledge and attitudes towards PrEP, the capacity of healthcare providers to provide information and prescribe PrEP and what policies for medication coverage are in place.

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We acknowledge that the land where this research took place is the traditional territory of many nations and is now home to many diverse First Nations, Inuit and Métis peoples.

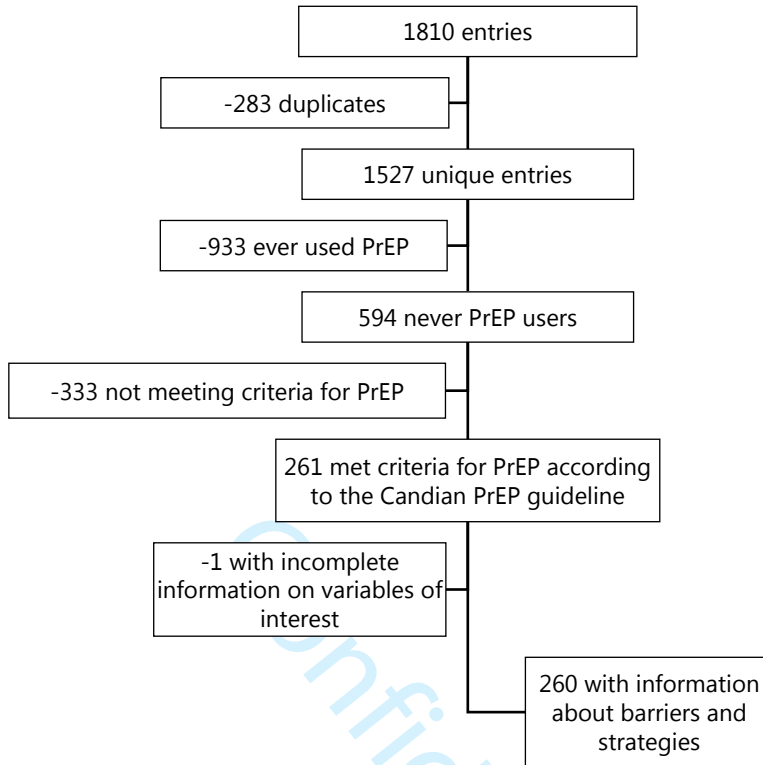
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Figure 1. Flowchart of survey participants.



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Table 1. Sociodemographic characteristics of all the study participants and stratified by province.

	All		Ontario		British Columbia		p-value
Age, median(IQR)	31 (26-38)		31 (26-37)		32 (27-40)		0.405
19-28	94	36%	68	37%	26	35%	
29-40	116	45%	85	46%	31	41%	
41-48	25	10%	15	8%	10	13%	
>=49	24	9%	16	9%	8	11%	
Total	259		184		75		
Sociocultural background							
White born in Canada	123	47%	88	48%	35	46%	0.044*
White born abroad	24	9%	17	9%	7	9%	
Black born in Canada	12	5%	12	7%	0	0%	
Black born abroad	3	1%	3	2%	0	0%	
East Asian born in Canada	6	2%	2	1%	4	5%	
East Asian born abroad	16	6%	7	4%	9	12%	
Latin born in Canada	3	1%	3	2%	0	0%	
Latin born abroad	19	7%	15	8%	4	5%	
Indigenous people of Canada	8	3%	5	3%	3	4%	
Other born in Canada**	20	8%	15	8%	5	7%	
Other born abroad**	26	10%	17	9%	9	12%	
Total	260		184		76		
Ethnicity							0.002*
White	147	57%	105	57%	42	55%	
Black	15	6%	15	8%	0	0%	
Indigenous people of Canada	8	3%	5	3%	3	4%	
East Asian	22	8%	9	5%	13	17%	
Southeast Asian	18	7%	9	5%	9	12%	
South Asian	7	3%	6	3%	1	1%	
Middle Eastern	11	4%	9	5%	2	3%	
Latinx	22	8%	18	10%	4	5%	
Others	10	4%	8	4%	2	3%	
Total	260		184		76		
Place of birth							0.345
Born in Canada	172	66%	125	68%	47	62%	
Born outside of Canada	88	34%	59	32%	29	38%	
Total	260		184		76		
Education							
High school or less	27	11%	20	11%	7	9%	0.116

College/technical	73	28%	46	25%	27	36%	
Bachelor's degree	102	40%	80	44%	22	29%	
Postgraduate degree	55	21%	36	20%	19	25%	
Total	257		182		75		

Annual Personal Income (CAD)

20.000 or less	31	12%	24	13%	7	9%	0.789
20.001-40.000	55	21%	41	22%	14	18%	
40.001-60.000	75	29%	50	27%	25	33%	
60.001-80.000	44	17%	29	16%	15	20%	
More than 80.000	37	14%	26	14%	11	15%	
Prefers not to answer	17	7%	13	7%	4	5%	
Total	259		183		76		

Gender

Man	250	97%	177	97%	73	96%	0.878*
Woman	4	1%	3	2%	1	1%	
Two-Spirit	1	1%	1	1%	0	0%	
Gender Fluid	4	1%	2	1%	2	3%	
Total	259		183		76		

Relationship status

No regular partner	125	49%	85	47%	40	53%	0.872*
Open relationship	93	36%	68	38%	25	33%	
Closed relationship	29	11%	21	12%	8	11%	
Prefers not to answer	10	4%	7	4%	3	4%	
Total	257		181		76		

Primary Care Provider

Yes	163	63%	124	67%	39	51%	0.040*
No	90	35%	56	30%	34	45%	
Prefers not to answer	7	3%	4	2%	3	4%	
Total	260		184		76		

How pays for medications

Private	153	59%	110	60%	43	57%	0.162*
IFHP-refugees†	1	1%	0	0%	1	1%	
NIHB-indigenous‡	5	2%	2	1%	3	4%	
BC Pharmacare	1	1%	0	0%	1	1%	
Ontario Drug Benefit	20	8%	17	9%	3	4%	
Out of pocket	71	27%	48	26%	23	30%	
Other	1	1%	1	1%	0	0%	
Prefers not to answer	7	3%	5	3%	2	3%	

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Total	259	183	76
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*Fisher's exact test. †IFHP: Interim Federal Health Program. #NIHB: Non-insured health benefits for First Nations people and Inuit.

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Table 2. HIRI score, STIs, use of PEP and self-perceived risk of HIV for all included study participants and stratified by province. Figures sum to >100% due to many participants meeting multiple criteria.

	All		Ontario		British Columbia	p-value
HIRI score, mean (SD)	20.5 (6.5)		21.0 (6.4)		19.4 (6.6)	0.066
Total	260		184		76	
Syphilis						0.381
Yes	59	30%	40	28%	19	35%
No	138	70%	102	72%	36	65%
Total	197		142		55	
Rectal chlamydia						0.843
Yes	36	17%	25	17%	11	18%
No	173	83%	123	83%	50	82%
Total	209		148		61	
Rectal gonorrhea						0.426
Yes	40	19%	31	20%	9	15%
No	174	81%	124	80%	50	85%
Total	214		155		59	
PEP more than once						0.413
Yes	15	6%	12	7%	3	4%
No	244	94%	171	93%	73	96%
Total	259		183		76	

Table 3. Reasons for not using PrEP for all study participants and stratified by province.

	All		Ontario		British Columbia		p-value
	n	%	n	%	n	%	
Concern about side effects	108	41%	77	42%	31	41%	0.875
Unable to afford it	92	35%	80	43%	12	16%	<0.001
Not feeling at high enough risk	76	29%	49	27%	27	36%	0.151
Unwillingness to take a pill regularly	65	25%	47	26%	18	24%	0.753
Lack of knowledge about where to get it	64	25%	48	26%	16	21%	0.391
Lack of protection against other STIs	50	19%	36	20%	14	18%	0.831
Consistent condom use for anal sex	33	13%	20	11%	13	17%	0.17
Concern about what others would think	32	12%	25	14%	7	9%	0.329
No particular reason	22	8%	17	9%	5	7%	0.483
Other*	18	7%	9	5%	9	12%	0.045
Belief that PrEP is not effective enough	11	4%	8	4%	3	4%	0.884
The HCP wouldn't prescribe it	10	4%	5	3%	5	7%	0.141
Lack of interest	8	3%	5	3%	3	4%	0.601
Total participants	260		184		76		

*Other reasons included: the process to getting PrEP is too complicated, busy schedule, no or infrequent anal sex, being monogamous, privacy issues, being told that they are not at high enough risk, among others.

Table 4. Strategies that ~~might~~ would more likely influence the decision to start PrEP for all participants and stratified by province.

Strategies that might influence the decision to start PrEP	All participants				Ontario				British Columbia				p-value
	More likely		No change or less likely		More likely		No change or less likely		More likely		No change or less likely		
Short waiting time to PrEP appointment	160	65%	88	35%	114	63%	66	37%	46	68%	22	32%	0.526
HCP informing about being at higher risk than perceived	155	63%	92	37%	111	62%	67	38%	44	64%	25	36%	0.837
Written step-by-step guide	152	61%	99	39%	109	60%	72	40%	43	61%	27	39%	0.861
People speaking publicly about PrEP	147	59%	101	41%	101	56%	79	44%	46	68%	22	32%	0.099
HCP informing about how well PrEP works	144	58%	103	42%	101	57%	77	43%	43	62%	26	38%	0.425
Help finding publicly funded PrEP	142	57%	106	43%	103	58%	76	42%	39	57%	30	43%	0.884
A list of PrEP providers	140	57%	107	43%	99	56%	79	44%	41	59%	28	41%	0.588
HCP counselling about side effects	136	55%	112	45%	92	51%	88	49%	44	65%	24	35%	0.055
People disclosing their PrEP use on apps	138	55%	111	45%	97	54%	84	46%	41	60%	27	40%	0.343
A navigator to find providers	128	51%	121	49%	91	51%	88	49%	37	53%	33	47%	0.774
An online program to calculate risk	124	50%	123	50%	90	51%	88	49%	34	49%	35	51%	0.856
A publicity campaign promoting PrEP	118	48%	129	52%	84	47%	96	53%	34	51%	33	49%	0.568
Information to bring to their HCP	94	38%	151	62%	60	34%	117	66%	34	50%	34	50%	0.020

Table S1 and S2. Reasons for not using PrEP stratified by level of formal education and sociocultural background and by ethnicity.

Reasons for not using PrEP	Less than Bachelor's		More than Bachelor's		p-value	Non-white and white born outside Canada		White born in Canada		p-value
	n	%	n	%		n	%	n	%	
Concern about side effects	43	43%	65	41%	0.755	60	43%	48	39%	0.466
Unable to afford it	43	43%	49	31%	0.049	48	35%	44	36%	0.867
Unwillingness to take a pill regularly	25	25%	40	25%	0.964	32	23%	33	27%	0.497
Lack of knowledge about where to get it	25	25%	39	24%	0.945	32	23%	32	26%	0.596
Not feeling at high enough risk	21	21%	55	34%	0.019	35	25%	41	33%	0.157
Consistent condom use for anal sex	16	16%	17	11%	0.217	17	12%	16	13%	0.867
Lack of protection against other STIs	14	14%	36	23%	0.084	27	20%	23	19%	0.859
No particular reason	12	12%	10	6%	0.111	9	7%	13	11%	0.24
Concern about what others would think	8	8%	24	15%	0.089	16	12%	16	13%	0.728
The HCP wouldn't prescribe it	5	5%	5	3%	0.454	6	4%	4	3%	0.645
Belief that PrEP is not effective enough	4	4%	7	4%	0.871	5	4%	6	5%	0.614
Other	3	3%	15	9%	0.047	9	7%	9	7%	0.8
Lack of interest	2	2%	6	4%	0.419	6	4%	2	2%	0.203

Reasons for not using PrEP	White	Black	Indigenous	East Asian	South East Asian	South Asian	Middle Eastern	Latinx	Other	p-value
Unable to afford it	52 (35%)	5 (33%)	1 (13%)	4 (18%)	3 (17%)	4 (57%)	6 (55%)	12 (55%)	5 (50%)	0.052
Unwillingness to take a pill regularly	43 (29%)	5 (33%)	1 (13%)	6 (27%)	0 (0%)	2 (29%)	1 (9%)	5 (23%)	2 (20%)	0.148
Lack of knowledge about where to get it	37 (25%)	4 (27%)	1 (13%)	6 (27%)	5 (28%)	2 (29%)	2 (18%)	4 (18%)	3 (30%)	0.989
Not feeling at high enough risk	50 (34%)	2 (13%)	2 (25%)	8 (36%)	4 (22%)	1 (14%)	4 (36%)	4 (18%)	1 (10%)	0.435
Consistent condom use for anal sex	21 (14%)	4 (27%)	1 (13%)	2 (9%)	3 (17%)	1 (14%)	0 (0%)	1 (5%)	0 (0%)	0.486
Lack of protection against other STIs	31 (21%)	2 (13%)	3 (38%)	5 (23%)	2 (11%)	1 (14%)	1 (9%)	3 (14%)	2 (20%)	0.856
No particular reason	18 (12%)	0 (0%)	1 (13%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	2 (9%)	1 (10%)	0.360
Concern about what others would think	19 (13%)	3 (20%)	3 (38%)	1 (5%)	1 (6%)	2 (29%)	0 (0%)	1 (5%)	2 (20%)	0.113
The HCP wouldn't prescribe it	6 (4%)	0 (0%)	0 (0%)	1 (5%)	0 (0%)	1 (14%)	0 (0%)	2 (9%)	0 (0%)	0.622
Belief that PrEP is not effective enough	6 (4%)	1 (7%)	0 (0%)	2 (9%)	1 (6%)	1 (14%)	0 (0%)	0 (0%)	0 (0%)	0.542
Other	11 (7%)	1 (7%)	0 (0%)	2 (9%)	3 (17%)	0 (0%)	1 (9%)	0 (0%)	0 (0%)	0.658

Lack of interest 5 (3%) 0 (0%) 0 (0%) 1 (5%) 0 (0%) 1 (14%) 1 (9%) 0 (0%) 0 (0%) 0.483

Table S3 and S4. Strategies that might influence the decision to start PrEP stratified by level of formal education and sociocultural background and by ethnicity.

Strategies that might influence the decision to start PrEP	Less than Bachelor's				Bachelor's degree or higher				p-value	Non-white and white born outside Canada				White born in Canada				p-value
	More likely	No change or less likely	More likely	No change or less likely	More likely	No change or less likely	More likely	No change or less likely		More likely	No change or less likely	More likely	No change or less likely	More likely	No change or less likely			
Short waiting time to PrEP appointment	53	56%	42	44%	107	70%	46	30%	0.024	87	66%	44	34%	73	62%	44	38%	0.509
Written step-by-step guide	52	54%	45	46%	100	65%	54	35%	0.074	84	62%	51	38%	68	59%	48	41%	0.561
A navigator to find providers	52	54%	45	46%	76	50%	76	50%	0.579	74	55%	60	45%	54	47%	61	53%	0.193
HCP informing about being at higher risk than perceived	49	52%	45	48%	106	69%	47	31%	0.007	90	68%	43	32%	65	57%	49	43%	0.084
HCP informing about how well PrEP works	49	52%	45	48%	95	62%	58	38%	0.123	81	61%	52	39%	63	55%	51	45%	0.37
People speaking publicly about PrEP	49	52%	45	48%	98	64%	56	36%	0.074	81	61%	52	39%	66	57%	49	43%	0.575
People disclosing their PrEP use on apps	49	52%	46	48%	89	58%	65	42%	0.338	77	57%	58	43%	61	54%	53	46%	0.577
Help finding publicly funded PrEP	44	47%	50	53%	98	64%	56	36%	0.009	83	62%	50	38%	59	51%	56	49%	0.078
HCP counselling about side effects	44	47%	50	53%	92	60%	62	40%	0.047	83	62%	50	38%	53	46%	62	54%	0.01
A list of PrEP providers	45	46%	52	54%	95	63%	55	37%	0.009	76	58%	55	42%	64	55%	52	45%	0.653
An online program to calculate risk	41	44%	53	56%	83	54%	70	46%	0.105	76	57%	58	43%	48	42%	65	58%	0.026
A publicity campaign promoting PrEP	41	43%	54	57%	77	51%	75	49%	0.251	68	51%	65	49%	50	44%	64	56%	0.254
Information to bring to their HCP	31	33%	64	67%	63	42%	87	58%	0.142	59	44%	74	56%	35	31%	77	69%	0.036

Strategies that might influence the decision to start PrEP	White	Black	Indigenous	East Asian	South East Asian	South Asian	Middle Eastern	Latinx	Other	p-value
Short waiting time to PrEP appointment	89 (64%)	9 (64%)	4 (67%)	14 (67%)	13 (72%)	6 (86%)	5 (45%)	15 (71%)	5 (50%)	0.781
Written step-by-step guide	83 (59%)	9 (64%)	4 (57%)	12 (55%)	14 (78%)	3 (43%)	7 (64%)	15 (68%)	5 (50%)	0.780
A navigator to find providers	67 (48%)	7 (50%)	3 (43%)	15 (68%)	12 (67%)	4 (57%)	3 (27%)	12 (57%)	5 (50%)	0.445

1	HCP informing about being at higher risk than perceived	83 (61%)	11 (73%)	2 (29%)	16 (73%)	13 (72%)	5 (71%)	7 (64%)	13 (65%)	5 (50%)	0.570
2	HCP informing about how well PrEP works	75 (55%)	9 (60%)	2 (29%)	17 (77%)	13 (72%)	4 (57%)	4 (36%)	14 (67%)	6 (60%)	0.227
3	People speaking publicly about PrEP	81 (59%)	6 (40%)	4 (57%)	14 (64%)	13 (76%)	3 (43%)	6 (60%)	14 (64%)	6 (60%)	0.698
4	People disclosing their PrEP use on apps	74 (54%)	7 (47%)	5 (71%)	13 (59%)	14 (78%)	4 (57%)	5 (45%)	13 (59%)	3 (30%)	0.413
5	Help finding publicly funded PrEP	75 (54%)	6 (46%)	3 (43%)	17 (77%)	12 (71%)	6 (86%)	5 (45%)	14 (64%)	4 (40%)	0.188
6	HCP counselling about side effects	68 (49%)	8 (53%)	1 (17%)	15 (71%)	14 (82%)	6 (86%)	6 (55%)	12 (55%)	6 (60%)	0.042
8	A list of PrEP providers	77 (55%)	9 (64%)	2 (29%)	15 (68%)	10 (59%)	5 (71%)	6 (60%)	11 (52%)	5 (56%)	0.805
9	An online program to calculate risk	60 (44%)	8 (53%)	3 (43%)	9 (41%)	13 (72%)	6 (86%)	7 (64%)	14 (67%)	4 (40%)	0.095
10	A publicity campaign promoting PrEP	59 (43%)	8 (53%)	5 (71%)	11 (50%)	12 (71%)	4 (57%)	4 (36%)	11 (52%)	4 (40%)	0.457
11	Information to bring to their HCP	39 (29%)	9 (60%)	3 (43%)	10 (48%)	11 (61%)	4 (67%)	3 (27%)	14 (64%)	1 (11%)	0.001

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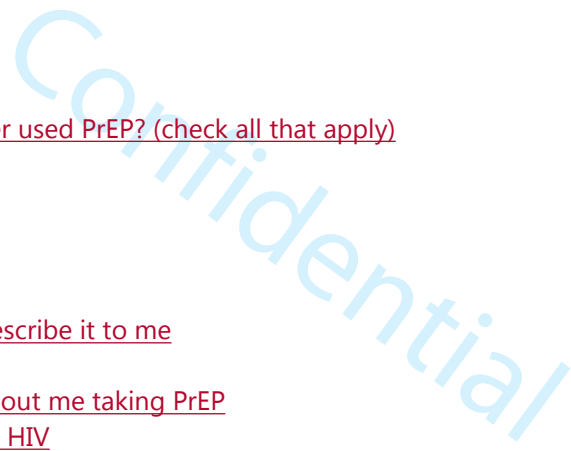
16 Appendix 1. Survey questions.

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18 Were any of the following part of the reason that you have never used PrEP? (check all that apply)

- 19 • I'm worried about side effects
- 20 • I didn't know where to get it
- 21 • I couldn't afford the medication cost
- 22 • I was diagnosed with HIV
- 23 • The healthcare provider I went to would not prescribe it to me
- 24 • I didn't feel I was at high enough risk for HIV
- 25 • I was worried about what others would think about me taking PrEP
- 26 • I don't think it is effective enough at preventing HIV
- 27 • It does not prevent other STIs
- 28 • I don't want to take a pill regularly
- 29 • I always use condoms for anal sex
- 30 • I can't be bothered
- 31 • No, there is no particular reason that I have never used PrEP
- 32 • Other reason (describe): _____

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39 How would each of these things change how likely you are to go onto PrEP?

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	<u>This would make me LESS likely to go on PrEP</u>	<u>This would not change how likely I am to go on PrEP</u>	<u>This would make me MORE likely to go on PrEP</u>
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4	<u>a. Information I could bring to my doctor to help</u>	<input type="radio"/>	<input type="radio"/>
5	<u>them learn about PrEP.</u>		
6	<u>b. A list of other providers in my area that prescribe</u>	<input type="radio"/>	<input type="radio"/>
7	<u>PrEP.</u>		
8	<u>c. A short waiting time for my first PrEP</u>	<input type="radio"/>	<input type="radio"/>
9	<u>appointment.</u>		
10	<u>d. A written step-by-step guide to going onto PrEP.</u>	<input type="radio"/>	<input type="radio"/>
11	<u>e. Someone working with me to find a provider that</u>	<input type="radio"/>	<input type="radio"/>
12	<u>prescribes PrEP.</u>		
13	<u>f. Someone working with me to access the publicly</u>	<input type="radio"/>	<input type="radio"/>
14	<u>funded PrEP program in my province.</u>		
15	<u>g. An online program that allows me to calculate</u>	<input type="radio"/>	<input type="radio"/>
16	<u>my risk of HIV.</u>		
17	<u>h. A healthcare provider telling me that my risk for</u>	<input type="radio"/>	<input type="radio"/>
18	<u>HIV is higher than I thought.</u>		
19	<u>i. A healthcare provider counselling me in detail</u>	<input type="radio"/>	<input type="radio"/>
20	<u>about how well PrEP works.</u>		
21	<u>j. A healthcare provider counselling me in detail</u>	<input type="radio"/>	<input type="radio"/>
22	<u>about the risk of PrEP side effects.</u>		
23	<u>k. A publicity campaign in my community</u>	<input type="radio"/>	<input type="radio"/>
24	<u>promoting PrEP as a responsible choice.</u>		
25	<u>l. More people in my community speaking publicly</u>	<input type="radio"/>	<input type="radio"/>
26	<u>about their experiences taking PrEP.</u>		
27	<u>m. More people on social media and hookup apps</u>	<input type="radio"/>	<input type="radio"/>
28	<u>disclosing that they are on PrEP.</u>		
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3 **Reasons for not using HIV PrEP and strategies that may facilitate HIV PrEP uptake in Ontario and British**
4 **Columbia among gay, bisexual and other men who have sex with men**
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33

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36

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39 data collection. MG analyzed qualitative component of the PRIMP study and gave input for the interpretation of
40 the data. All authors reviewed the various versions of the manuscripts and provided feedback.
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