Measures of HIV pre-exposure prophylaxis uptake among gay, bisexual, and other men who have sex with men in Canada and demographic disparities among those at elevated likelihood for HIV acquisition

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Abstract (150 words)

HIV pre-exposure prophylaxis (PrEP) is an effective prevention tool being scaled up in Canada. We describe PrEP uptake and identify demographic correlates of uptake among gay, bisexual, and other men who have sex with men (gbMSM) at elevated HIV risk using data from an online survey of gbMSM residing in Canada between Oct 2017 and Jan 2018. Among the 969 participants at elevated HIV risk who had recently tested for HIV, 96.0%, 83.3%, 72.6%, and 39.7% reported awareness, knowledge, acceptability, and pursuit of PrEP, respectively; 27.1% had ever and 24.6% were currently taking PrEP. The strongest correlate of PrEP uptake was living in a city of ≥500,000 inhabitants; others included being out to all or almost all family, friends, and colleagues regarding sexual attraction to men, greater financial coping, and being 30–49 years of age. Improved upscaling of PrEP in Canada may be accomplished through consideration of these disparities.

Key words

Pre-exposure prophylaxis (PrEP), uptake, GBMSM, correlates, disparities, Canada

Introduction

Gay, bisexual, and other men who have sex with men (gbMSM) continue to comprise the largest proportion of the HIV epidemic in Canada, accounting for 61.0% of HIV cases among males with known exposure category in 2019 (1). Among these, 37.7% were under 30 years of age, 47.2% were between 30 and 49 years, and 15.0% were 50 years of age or older (1). Among all male HIV cases with known race/ethnicity in 2019, non-white males were vastly overrepresented, comprising 61.5% of cases and only 22.3% of the population in the 2016 census (1, 2). As with other jurisdictions, the HIV epidemic among gbMSM in Canada and inequities within it demand a nuanced and effective response.

Pre-exposure prophylaxis (PrEP) is highly effective at preventing HIV acquisition through the use of once-daily oral antiretroviral medication (emtricitabine and tenofovir disoproxil fumarate) by HIV-

negative individuals as oral chemoprophylaxis. Previous research has demonstrated the efficacy of PrEP (>90% reduction in HIV acquisition risk) in preventing HIV infection among gbMSM when taken as prescribed (3-5). PrEP became legally available in Canada in February 2016, when Health Canada issued a formal Notice of Compliance (6). PrEP offers significant potential to prevent new HIV infections; thus, an effort has been made in widespread provision of PrEP to gbMSM in Canada (5, 7). Delivery of PrEP in Canada has been through a centralized clinical avenue, with individuals requiring a prescription from a physician (8). Further, most PrEP prescriptions have come from a limited number of specialist physicians with expertise in antiretroviral medications (8). PrEP costs at minimum 250 CAD (207 USD PPP in 2017) per month to purchase in Canada without drug coverage (9, 10). Coverage of this expense varies across the country based on province/territory of residence and federal programs for specific groups (Canadian Armed Forces, refugees, First Nations and Inuit people). All provinces have introduced at least partial coverage of the expense of PrEP since the time our data was collected (Oct 2017-Jan 2018); however, coverage at this time only existed through federal programs for the aforementioned groups, partial coverage in the provinces of Quebec and Ontario, and complete coverage in the province of British Columbia beginning in the latter month of our data collection (11). Therefore, employment benefits providing private health insurance may have been and continue to be requisite for the uptake of PrEP for many GBMSM in Canada.

Previous research has identified four main components of uptake of PrEP by gbMSM: awareness, acceptability/willingness/interest, use/uptake, and adherence/retention/discontinuation (5, 12-19). Awareness of PrEP has been reported to be high among gbMSM in Canadian urban settings (80.0–96.0%), while acceptability/willingness has been intermediate (50.0–56.5%) and uptake has increased significantly by 2018 (23.3-35.2%) (20-23). Little research pertaining to PrEP uptake among gbMSM has been published within the Canadian context and none has been published outside of a large urban setting. Further, no publications exist with respect to gbMSM at objectively elevated risk for HIV or for gbMSM who report having attempted access to PrEP.

Identifying correlates of PrEP uptake is imperative to its successful widespread implementation. Published socio-demographic correlates of awareness and acceptability of PrEP among gbMSM in urban Canadian settings include greater personal income, higher education, being middle-aged (for awareness only), open or single relationship status (for acceptability only), being part of a serodiscordant couple, and lacking drug insurance, while correlates of low awareness and acceptability include Aboriginal/Indigenous or Latino ethnicities compared with non-Latino White, bisexual sexual identity, younger age (for acceptability only among Black gbMSM), single relationship status (for awareness only), and being born in Canada (20, 22, 24, 25). Associations beyond objective behavioural HIV risk (e.g., socio-economic status) demonstrate the impact of social determinants on PrEP uptake, similar to those reported in HIV testing (26). Therefore, without a targeted effort guided by social determinants, barriers to the widespread national provision of PrEP may further exacerbate existing health inequities in HIV acquisition.

Widespread availability of PrEP offers substantial promise to the prevention of new HIV infections in Canada. Determining correlates of PrEP uptake enable better informed scale up, and the identification of socio-demographic correlates highlights inequities in its provision across Canada to date. Equitable provision of PrEP is especially imperative with respect to gbMSM at elevated risk of HIV acquisition. The objectives of this analysis are to: 1) describe measures of PrEP uptake among different sub-populations in a sample of gbMSM collected across Canada and 2) document the socio-demographic correlates of PrEP uptake among HIV-negative gbMSM at elevated risk for HIV in Canada who have received an HIV test in the past 12 months and among a subsample of this population who reported attempted access to PrEP. These findings build on a broad national report of the same data (27) and review the provision of PrEP in its initial years in Canada among high-risk gbMSM already interfacing with sexual health care and to inform future health system provision and planning.

Methods

Study design and participants

Data were drawn from the European Men-who-have-sex-with-men Internet Survey (EMIS-2017), a cross-sectional online self-interview of gbMSM across 50 countries, including Canada. In Canada, the Public Health Agency of Canada (PHAC) formed an Expert Working Group of community-involved researchers that informed the promotion efforts, provided feedback on the questionnaire, and funded the promotion of the survey to Canadian gbMSM. Participants were recruited through instant messages and banner advertising on national and international gay websites, push messages on geo-spatial mobile phone applications, and social media promotion, alongside engagement with key news media and outreach from community-based organizations working with gbMSM. The sample is therefore a self-selected sample. Data were collected from October 18, 2017 to January 31, 2018. Eligibility criteria for the Canadian sample included: living in Canada; identifying as a man and/or trans man; being sexually attracted to men and/or having ever had sex with men; and being aged 16 or older. The questionnaire was available in 33 different languages, including the two official languages of Canada: English and French. The survey was designed and executed by *Sigma Research* at the London School for Hygiene and Tropical Medicine. Detailed descriptions of the overall methods (28) and the Canadian sample (27) have been published elsewhere. Approval was granted by Health Canada and the Public Health Agency of Canada's Research Ethics Board.

Dependent variables

Six components of PrEP uptake are reported as outcomes: awareness, knowledge, likelihood to use if made available and affordable (considered a measure of acceptability), having tried to get, having ever taken, and current taking. Awareness was derived from the question "Have you heard of PrEP", dichotomized between the response "Yes" and "No" or "Not sure". Knowledge was derived from a questionnaire item that provided a statement specified to be true and a knowledge response set, which was dichotomized between "I knew this already" and all other options. The statement read, "Pre-Exposure prophylaxis (PrEP) involves someone who does not have HIV taking pills before as well as after sex to prevent them getting HIV". The "likely to use PrEP" variable was derived from the question "If PrEP was available and affordable to you, how likely would you be to use it?", with a 5-point Likert scale from

"Very unlikely" to "Very likely". The two "likely" options formed the affirmative response versus all others. The questionnaire item "Have ever tried to get PrEP?" had "Yes / No" options. The item "Have you ever taken PrEP?" had the response options "[1] No / [2] Yes, on a daily basis and I'm still taking it / [3] Yes, on a daily basis but I'm no longer taking it / [4] Yes, when I have needed it but not daily / [5] I don't know". All "Yes" options (2-4) were collapsed to form the affirmative response for having ever taken PrEP, while only the current options (2 & 4) were collapsed to form the affirmative response for currently taking PrEP.

Independent variables

Independent demographic variables included age, ethnic/racial minority, relationship status, city size, outness, financial coping, education, sexual identity, and employment status. Location of last HIV test was considered in order to identify potential structural shortcomings in connecting gbMSM to PrEP provision sources. It is important to note that community health services do not generally provide PrEP in Canada. Ethnic/racial minority was defined by the questionnaire item "Do you consider yourself a member of an ethnic or racial minority in Canada?" with dichotomous "Yes / No" options. City size was collapsed into three levels: living in a big/medium/small municipality, representing ≥500,000, 100,000-499,999, and <100,000 inhabitants, respectively. Outness was derived from the questionnaire item "Thinking about all the people who know you (including family, friends and work or study colleagues), what proportion know that you are attracted to men?", dichotomized between "All or almost all" and all other response options. Financial coping was derived from the item "Which of these phrases would you say comes closest to your feelings about your income these days?". The 5-point Likert response scale ranged from "Living very comfortably" to "Really struggling", and was dichotomized in this analysis between the first two comfortable options versus not. Education was a measure of years spent in full-time education since the age of 16.

Analytic subsamples

Subsample at elevated HIV risk

The analytic subsample at elevated HIV risk was created by including only participants who received a negative HIV test result in the previous twelve months and met the criteria for elevated risk of HIV acquisition. These criteria for elevated HIV risk followed the indications for PrEP for gbMSM from the Canadian guidelines as closely as possible (29). They include participants who reported condomless anal intercourse (CAI) in the previous twelve months and at least one of: a bacterial sexually transmitted infection (Syphilis, Gonorrhea, and/or Chlamydia) in the previous twelve months (anatomic site not specified); use of non-occupational post-exposure prophylaxis (nPEP) more than once ever; having an HIV-positive steady male partner (e.g. boyfriend/husband) who the participant did not know to have an undetectable viral load. The Canadian guidelines include a HIV incidence risk index for men who have sex with men (HIRI-MSM) score ≥11 as a fourth criterion, which provides a numeric score based on age and reported behaviours (30). As the EMIS-2017 questionnaire was a broad survey serving 50 countries, it did not contain the items required to specifically assign HIRI-MSM scores to participants. Instead, we used the indicators of CAI in the previous twelve months with at least one HIV-positive non-steady partner (casual sex partners and/or regular sex buddies) not known to be undetectable, and/or CAI in the previous twelve months with at least one non-steady partner whose HIV status the participant did not know at the time of the encounter. We conducted a complete case analysis for models, thus only participants with complete data with respect to being likely to take PrEP, having tried to get PrEP, and currently taking PrEP, as well as all of the independent variables, were included. With respect to the breakdown of these independent variables, a comparison of the complete case analysis sample and the population of participants excluded due to incomplete data is shown in **Supplemental Table I**. Chi-square tests of significance show that there were no statistically differences between these two groups. All variables, including HIV diagnosis, were self-reported.

Subsample at elevated HIV risk who tried to get PrEP

From the sample at elevated HIV risk described above, an additional analytic subsample was created including only participants who reported having tried to get PrEP.

Statistical analysis

Frequencies and proportions reporting awareness of PrEP and PrEP knowledge are reported among all participants regardless of HIV diagnosis or testing history. All six components of PrEP uptake were reported among participants who had never been diagnosed with HIV, as well as among the subsample at elevated HIV risk. Having ever taken PrEP and currently taking PrEP are reported among the subsample at elevated HIV risk who tried to get PrEP. Baseline descriptive statistics were conducted among the subsample at elevated HIV risk, as well as among the subsample at elevated HIV risk who tried to get PrEP; logistic regression models were conducted among these subsamples only. Univariable logistic regression models and chi-square tests were conducted for each of the PrEP uptake measures and independent variables. Multivariable logistic regression models were conducted for each PrEP uptake measure with six of the independent variables selected based on conceptual rationale, independent of the bivariate findings. This rationale included the selection of demographic variables of primary interest, avoiding collinearity between covariates, and related to this, including only one proxy indicator of socioeconomic status (financial coping was selected over education or employment). Uni- and multivariable analyses for being currently on PrEP were conducted among both the subsample at elevated HIV risk and the subsample at elevated HIV risk who tried to get PrEP. All statistical tests were two-sided and considered significant at $\alpha < 0.05$. All analyses in this study were conducted using SAS® versions 9.4 (SAS, North Carolina, United States).

With the exception of being currently on PrEP among those who tried to get PrEP, this analysis deliberately avoided any "PrEP Cascade" or additional predications of outcomes on other outcomes, as not all outcomes need to be fulfilled for a participant to be currently taking PrEP (i.e. someone could be currently taking PrEP because it was recommended to them through their sexual health care without them ever truly having "tried to get" PrEP). Instead, each outcome is a distinct measure and they together tell a complete story of public health relevance. Further, while a true cascade conceptualizes that the ideal is for all measures to reach 100% fulfillment, the authors do not advocate that all HIV-negative gbMSM in Canada should necessarily meet each of these outcomes and that all should be taking PrEP.

Results

A total of 6059 participants living in Canada were recruited into the study, 5473 (90.3%) of whom provided non-discrepant data regarding age, steady sexual partners, and/or non-steady sexual partners and were included in our analyses. Of them, 4962 (90.7%) had never been diagnosed with HIV, and 1057 (21.3%) of them had been tested for HIV in the previous twelve months and met the criteria for elevated HIV risk. 969 (91.7%) of those had complete data for all variables of interest and therefore constituted the subsample at elevated HIV risk. Of them, 385 (39.7%) had ever tried to get PrEP and constituted the subsample at elevated HIV risk who tried to get PrEP.

Frequencies and proportions of participants that reported each of the PrEP uptake measures among the different populations are shown in **Table I**. 7.8% of non-HIV-diagnosed participants were currently taking PrEP (6.5% on a daily basis, and 1.3% when needed/on demand); this figure was 24.6% among the subsample at elevated HIV risk and 61.0% among the subsample who had tried to get PrEP.

Descriptive statistics of the subsample at elevated HIV risk and subsample at elevated HIV risk who tried to get PrEP are shown in **Table II**. Among the subsample at elevated HIV risk, 45.0% were aged 30-49 years, 35.2% were aged 16-29 and 19.8% were aged 50 years or greater; 22.9% self-identified as an ethnic/racial minority, 60.7% were out to all or almost all, and 49.3% were financially comfortable. The city size breakdown of the subsample at elevated HIV risk was: 67.8% big city, 17.6% medium city, and 14.6% small city/rural. The composition of the subsample at elevated HIV risk who tried to get PrEP was fairly similar with respect to these variables, however 54.3% were aged 30-49 years, 78.2% lived in a big city and 68.3% were out to all or almost all. Univariable associations of correlates of being likely to use PrEP, having tried to get PrEP, and being currently on PrEP are shown in **Table III**.

Subsample at elevated HIV risk

The significant unadjusted correlates of being likely to use PrEP were having 7+ years of education post 16 years of age compared with 0–3 years (odds ratio [OR] 1.62, 95% confidence interval [CI] 1.11–2.35), being 50 or more years of age versus 30–49 years (OR 0.59, 95% CI 0.41–0.86), and having a steady partner versus being single (OR 0.69, 95% CI 0.52–0.93). The strongest significant unadjusted correlate of having tried to get PrEP was gay sexual identity compared to bisexual/other

identity (OR 2.61, 95% CI 1.67–4.08). The strongest significant unadjusted correlates of currently taking PrEP was full-time versus part-time employment (OR 5.07, 95% CI 2.00–12.85) and living in a big city (≥500,000 inhabitants) compared to a small city (<100,000 inhabitants, OR 4.81, 95% CI 2.60–8.88). Compared to a community health service, being last tested for HIV at a private practice (OR 2.52, 95% 1.76-3.62) or hospital (OR 1.67, 95% CI 1.11–2.52) were associated with currently taking PrEP. Relative to participants with 0-3 years of education post 16 years of age, those with 4-6 years (OR 1.55; 95% CI 1.05-2.30) and 7 or more years (OR 2.26, 95% CI 1.57-3.27) were more likely to have tried to get PrEP, and participants with 4-6 years (OR 2.18; 95% CI 1.31-3.62) and 7 or more years (OR 3.15, 95% CI 1.95-5.09) were more likely to be currently taking PrEP.

Adjusted multivariable associations of correlates are shown in **Table IV**. Living in a big city was a significant independent correlate of having tried to get PrEP (adjusted odds ratio [aOR] 2.30, 95% CI 1.52–3.49) and currently taking PrEP (aOR 4.48, 95% CI 2.40–8.38). Being out to all or almost all was a significant independent correlate of having tried to get PrEP (aOR 1.62, 95% CI 1.22–2.15), and currently taking PrEP (aOR 1.97, 95% CI 1.39–2.78). Being financially comfortable was a significant independent correlate of being likely to use PrEP (aOR 1.37, 95% CI 1.02–1.84), and currently taking PrEP (aOR 1.97, 95% CI 1.43–2.72). Being 50+ years of age versus 30–49 years was a significant independent negative correlate of all PrEP measures: being likely to use PrEP (aOR 0.56, 95% CI 0.38–0.82) having tried to get PrEP (aOR 0.65, 95% CI 0.45–0.93), currently taking PrEP (aOR 0.58, 95% CI 0.39–0.89). Being 16–29 years of age versus 30–49 years was a significant independent correlate of having tried to get PrEP (aOR 0.52, 95% CI 0.38–0.70) and currently taking PrEP (aOR 0.43, 95% CI 0.29–0.62). Sexual identity was not included in multivariable models as it was strongly correlated with outness (Cramer's V = 0.26), and education was similarly not included as it was strongly correlated with financial coping (Cramer's V = 0.16)(31).

Univariable and multivariable analyses for awareness of PrEP and PrEP knowledge, respectively, are shown in **Supplemental Table II** and **Supplemental Table III**. Not being an ethnic/racial minority was a significant independent correlate of awareness of PrEP (aOR 2.47, 95% CI 1.21–5.02). Being out to

all or almost all was a significant independent correlate of both awareness of PrEP (aOR 3.38, 95% CI 1.64–7.00) and PrEP knowledge (aOR 1.95, 95% CI 1.37–2.79). Being 50+ years of age versus 30–49 years was also a significant independent correlate of PrEP knowledge (aOR 0.44, 95% CI 0.28–0.69). Other significant independent correlates of PrEP knowledge were living in a big (aOR 1.85, 95% CI 1.18–2.90) or medium city (aOR 1.93, 95% CI 1.09–3.42), and being financially comfortable (aOR 1.70, 95% CI 1.18–2.45).

Subsample at elevated HIV risk who tried to get PrEP

Among the sample at elevated HIV risk who tried to get PrEP, the strongest significant unadjusted correlate of currently taking PrEP was other employment (including unemployed, student, retired, long-term sick leave/medically retired, OR 7.06, 95% CI 2.38–20.93) and full-time (OR 6.91, 95% CI 2.50–19.10) versus part-time employment. Having been last tested for HIV at a private practice versus a community health service was a significant unadjusted correlate of currently taking PrEP (OR 1.92, 95% CI 1.17–3.15). The significant independent correlates of currently taking PrEP were living in a big city (aOR 3.41, 95% CI 1.58–7.36), being out to all or almost all (aOR 1.89, 95% CI 1.17–3.05), being financially comfortable (aOR 2.59, 95% CI 1.64–4.08), and being between 16 and 29 years old (aOR 0.58, 95% CI 0.34-0.96).

Discussion

In this large national sample of gbMSM living in Canada, 7.8% of non-HIV-diagnosed participants were currently taking PrEP, predominantly on a daily basis. PrEP uptake varied by subpopulation and showed both success in PrEP promotion efforts and identification of where targeted work needs to be done among gbMSM in Canada. There was a fairly strong community awareness of PrEP and PrEP knowledge among all participants (including those living with HIV). Among the subsample at elevated HIV risk, larger proportions reported awareness of PrEP and PrEP knowledge, an encouraging result. Approximately half of gbMSM who had never been diagnosed with HIV reported being likely to use PrEP if made available and affordable, a similar result to that reported among gbMSM in Toronto in 2016 (21). This measure of acceptability rises to 72.6% among gbMSM at elevated HIV

risk, an improvement from the broader population but still denoting a lack of acceptance among more than a quarter of this population that may warrant intervention. Sequentially smaller proportions of gbMSM reported having tried to get PrEP, ever taking PrEP, and currently taking PrEP. Among gbMSM at elevated risk for HIV, the largest decrease occurred between those who considered themselves likely to use PrEP (72.6%) and those who had tried to get it (39.7%); only two thirds (67.5%) of those at elevated HIV risk who had tried to get PrEP reported having ever taken PrEP and 61.0% reported currently taking it. These findings suggest that while awareness and knowledge are reasonably robust among gbMSM at elevated HIV risk in Canada, impediments exist to the acceptability, access, and successful uptake of this HIV prevention intervention.

The findings identify a number of demographic disparities in the uptake of PrEP among gbMSM at elevated HIV risk. City size was the strongest independent correlate of PrEP uptake. While no significant independent variation was found across city sizes in being likely to use PrEP, gbMSM in small cities or towns (<100,000) were significantly less likely to have tried to get PrEP and to be currently taking PrEP relative to their counterparts in big cities (≥500,000). The latter was true among both gbMSM at elevated HIV risk and those who specifically tried to get PrEP. Diminished access to and uptake of PrEP in rural environments has been reported elsewhere (32, 33), and may be explained to some degree by gbMSM in small cities also being significantly less likely to have PrEP knowledge as evidenced in our findings. While new HIV diagnoses among gbMSM in Canada continue to be predominantly among those living in large urban centres in Canada (34), these findings highlight both the existence of gbMSM at elevated HIV risk living in smaller cities in Canada and their relatively diminished uptake of PrEP. Educational and promotional efforts regarding PrEP and gbMSM, while achieving success in larger urban centres, should take account of individuals in smaller municipalities and consider prudent geographic expansion (16).

Compared with gbMSM who were fully out, gbMSM who were less out were significantly less likely to report all PrEP measures with the exception of being likely to use. This can likely be explained to some degree by gbMSM who were not out being significantly less likely to be aware of PrEP and have

PrEP knowledge in our study, as being part of a gay sub-culture is likely to enable access to information about PrEP. Further, among gbMSM at elevated HIV risk who tried to get PrEP, those not out to all or almost all were significantly and independently less likely to currently take PrEP. We conjecture that this may be explained at least in part by gbMSM who are not predominantly out being less likely to disclose same-sex behaviours to health care providers when trying to get PrEP and PrEP potentially being perceived as something that could 'out' someone as gay/bisexual (35). These results overlap with our findings of bisexual MSM being less likely to report all PrEP measures (with the exception of being likely to use), in that it has been previously demonstrated that bisexual MSM are less likely to disclose their sexuality both socially and to health care providers (36, 37). As not being out to all or almost all appears to be a substantial barrier to the uptake of PrEP, provision of PrEP may benefit from more inclusive and perhaps dedicated clinical environments, decentring PrEP as a gay-specific HIV intervention, educational efforts beyond gay communities, and continued work to eliminate homophobia in Canadian health care and culture. Interventions that allow indirect communication of HIV risk behaviours (scales completed in privacy, *i.e.* HIRI-MSM) and that provide information regarding the benefits of considering PrEP may be especially useful in circumventing conversations considered uncomfortable to some gbMSM while still providing prudent preventative sexual health care.

Participants in the current study who were not financially comfortable were significantly less likely to consider themselves likely to use PrEP and to currently take PrEP. As a proxy measure of socio-economic status, less affluent gbMSM being less likely to use PrEP may speak to lower education levels and decreased understanding and/or trust of the intervention, as evidenced in them being less likely to have PrEP knowledge. This is also reflected in our findings with gbMSM with less education and gbMSM not employed full-time reporting decreased PrEP uptake. Among those at elevated HIV risk who tried to get PrEP, gbMSM who were financially comfortable were substantially more likely than those who were not to currently take PrEP, an effect size second only to living in a big city. Given the out-of-pocket expense of HIV PrEP in Canada (9), and the fact that Canada remains the only developed nation with a publicly funded healthcare system that does not include universal coverage for prescription drugs

(38), these results corroborate previous research in Canada and elsewhere that reports lower SES as a barrier to PrEP uptake (19, 22, 24). These findings show the need for policies facilitating improved financial access to PrEP, some of which have been enacted in some Canadian provinces since our data were collected (11). The country's two most populous provinces (Ontario and Quebec) still do not provide free access for all people for whom PrEP is clinically indicated. Additionally, facilitation of accessible education efforts targeted to gbMSM of lower socioeconomic status may be of value.

Relative to gbMSM aged 30-49, older gbMSM (aged 50 and over) were less likely to report being likely to use PrEP, having tried to get PrEP, and to be currently taking PrEP, while those aged 16–29 were less likely to report the latter two measures. The former disparity can likely be at least partially explained by gbMSM aged 50+ also being less likely to have PrEP knowledge, suggesting that information about PrEP has not permeated all generations of gbMSM equally. gbMSM aged 50+ who have not acquired HIV may also have lower HIV risk and/or decreased diligence with prevention options. Further, the HIRI-MSM scale ascribes lower risk to older age and makes it more difficult for older gbMSM to clinically qualify for PrEP. This may be problematic as those aged 50+ comprised 15.0% of HIV cases among gbMSM in Canada in 2019 (1). Research from international settings concurs that younger gbMSM have greater acceptance of PrEP (19), however the reduced uptake by gbMSM youth may relate to reduced perception of HIV risk, different risk behaviours, and/or being less likely to have full-time employment inclusive of drug benefit coverage to cover the considerable expense of PrEP (39).

Participants of ethnic/racial minorities were significantly less likely to report awareness of PrEP, corroborating research of gbMSM in Vancouver that found that Aboriginal and Latino gbMSM reported decreased awareness between 2012–2016 (22). However, there were no significant associations between ethnicity and all other measures of PrEP uptake in our analysis. While these results may be impeded by the lack of granularity with respect to ethnic/racial diversity, they still advocate that diverse non-white gbMSM may benefit from targeted and accessible awareness and information campaigns as employed in the United States (40).

There was no significant variation in being likely to use PrEP across locations of last HIV test, however those last tested in a private practice were more likely to be currently taking PrEP, presumably because they were already connected to a medical doctor for sexual health care. gbMSM who last tested at a community health service were significantly and substantially less likely to be currently on PrEP. Some community health services, particularly those in smaller communities, may lack PrEP provision services to refer to. Regardless, this suggests a dearth in infrastructure connecting appropriate patients to PrEP provision services and these testing episodes represent missed opportunities for PrEP referral and implementation.

Our study is not without limitations. Our study sample represented a self-selected sample. We were limited in our ability to define our subsample at elevated HIV risk entirely congruently with the Canadian guidelines for PrEP (29). Instead, we followed these guidelines where possible and established a logical sample of gbMSM at elevated risk for HIV acquisition from which reasonable conclusions can be drawn. We were not able to capture any ethnic/racial granularity with the dichotomous ethnic/racial minority variable used. We do not account for geography in our analysis; multi-level modeling accounting for provinces was impractical because of small cell counts and considered unwarranted in that PrEP was not being broadly provided free of charge in any province at the time of data collection (11). Given that some provinces offer low- or no-cost access to PrEP, future research should examine how financial access and barriers lead to differential PrEP uptake. Further, differences across regions were thought to largely reflect variations in city size, as these were found to be correlated. The data may be limited by social desirability and recall biases but these may be mitigated by the privacy provided by an anonymous online survey without IP recording, and by recall of behaviours being limited to within the previous year.

Conclusions

Awareness of PrEP and PrEP knowledge were high among gbMSM at elevated HIV risk in Canada, however substantially smaller proportions reported attempted access or current use of PrEP. The strongest independent correlate of PrEP uptake was living in a city of ≥500,000 inhabitants; others

included being out to all or almost all regarding sexual attraction to men, being financially comfortable, and being of 30-49 years of age. Improved and more equitable upscaling of PrEP provision in Canada may be accomplished through targeted outreach that addresses these disparities.

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