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Gay Men's Understanding and Education of New HIV Prevention Technologies in Vancouver, Canada

Benjamin J Klassen[1,a], **Nathan J Lachowsky**[1,2,b], **Sally Yue Lin**[1,c], **Joshua B Edwards**[3,d], **Sarah A Chown**[4,e], **Robert S Hogg**[1,5,f], **David M Moore**[1,2,g], and **Eric A Roth**[6,7,h]

[1]Epidemiology and Population Health, British Columbia Centre for Excellence in HIV/AIDS, 608-1081 Burrard Street, Vancouver, BC, Canada, V6T 1Y6

[2]Faculty of Medicine, University of British Columbia, 2194 Health Sciences Mall, Vancouver, BC, Canada, V6T 1Z3

[3]Health Initiative for Men, 421-1033 Davie St, Vancouver, BC, Canada, V6E 1M7

[4]YouthCO HIV & Hep C Society, 568 Seymour St, Vancouver, BC, Canada, V6B 3K4

[5]Faculty of Health Sciences, Simon Fraser University, 8888 University Drive, Burnaby, BC, Canada, V5A 1S6

[6]University of Victoria, Victoria, Canada, 3800 Finnerty Rd, Victoria, BC, Canada, V8P 5C2

[7]Centre for Addictions Research of British Columbia, 2300 McKenzie Ave, Victoria, BC, Canada, V8N 5M8

Abstract

Effective rollout of HIV treatment-based prevention such as pre-exposure prophylaxis and Treatment as Prevention has been hampered by poor education, limited acceptability, and stigma among gay men. We undertook a thematic analysis regarding the education sources and acceptability of these New Prevention Technologies (NPTs) using fifteen semi-structured

Correspondence to: Nathan J Lachowsky.

[a]ben_klassen@sfu.ca
[b]nlachowsky@cfenet.ubc.ca
[c]slin@cfenet.ubc.ca
[d]joshua@checkhimout.ca
[e]sarahc@youthco.org
[f]bobhogg@cfenet.ubc.ca
[g]dmoore@cfenet.ubc.ca
[h]ericroth@uvic.ca

Availability of data and material: Data and interview guide are from the Momentum Health Study whose authors may be contacted at the British Columbia Centre for Excellence in HIV/AIDS.

Authors' contributions: RSH, DMM, and EAR are the principal investigators on the Momentum Health Study and oversaw the project. NJL and SYL prepared research questions and constructed the interview guide for this sub-study. NJL, SYL, and BJK coded and organized the dataset. BJK and NJL prepared manuscript with extensive feedback and contributions from all co-authors. All authors read and approved the final manuscript.

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interviews with gay men in Vancouver, Canada who were early adopters of NPTs. NPT education was derived from a variety of sources, including the Internet, healthcare providers, community organizations, sexual partners, and peers; participants also emphasized their own capacities as learners and educators. Acceptable forms of NPT education featured high-quality factual information, personal testimony, and easy access. Stigma was highlighted as a major barrier. In order for public health, policy makers, and gay communities to optimize the personal and population benefits of NPTs, there is a need for increased community support and dialogue, anti-stigma efforts, early NPT adopter testimony, and personalized implementation strategies.

Keywords

pre-exposure prophylaxis; post-exposure prophylaxis; gay and bisexual men; health education; HIV prevention

BACKGROUND

While rates of HIV-related mortality have seen a sharp decline in Canada and elsewhere globally over the last two decades, the number of new HIV diagnoses in recent years has remained relatively consistent, particularly among gay and other men who have sex with men (BC Centre for Disease Control, 2015; Moore et al., 2012; Public Health Agency of Canada, 2013; Public Health Agency of Canada, 2014). Despite concerted prevention efforts and the increased implementation of antiretroviral therapy, gay men continue to be vastly overrepresented in the epidemic, accounting for approximately half of all new diagnoses country-wide.

The introduction of New Prevention Technologies (NPTs) has had a profound impact on conceptions of risk management and HIV prevention within the realm of gay men's sexual health. Consisting of several biomedical interventions, NPTs make use of various forms of antiretroviral therapy to combat the transmission of HIV on both individual- and population-based levels (Peissel, 2010). This catalogue of interventions includes Treatment as Prevention (TasP) – the use of antiretroviral therapy to treat HIV-positive individuals, thus lowering individual and population-level viral loads (Montaner, 2011); Pre-Exposure Prophylaxis (PrEP) – the consistent use of antiretroviral therapy by HIV-negative individuals prior to potential exposure to prevent seroconversion (Grant et al., 2010); and Post-Exposure Prophylaxis (PEP) – a 28-day course of antiretroviral therapy taken by HIV-negative individuals immediately following a potential exposure to prevent seroconversion (Mayer et al., 2016). As the body of evidence pertaining to the *efficacy* of these tools continues to grow, there is little doubt that NPTs have begun to alter the meanings of HIV prevention and risk reduction, with particular implications for condom use and seroadaptive practices, thus adding nuance to the dominant HIV prevention discourse of the last three decades (Young & McDaid, 2014).

This NPT-facilitated shift in the broad HIV prevention paradigm has been the subject of intense debate among social scientists, with Treatment as Prevention (TasP) generating the most extensive discussion thus far. Scholars have questioned the real-world effectiveness of TasP within the complex realm of individual sexual choices and behavior opposed to the

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abstraction of mathematical population modelling (Guta, Murray, & Gagnon, 2016; Patton, 2011; Persson, 2015). Additionally, scholars have problematized the underlying ethics of this prevention paradigm (Nguyen, Bajos, Dubois-Arber, O'Malley, & Pirkle, 2011). Patton (2011) argues that the introduction of TasP has seen a profound movement away from a model premised on individual, humanized, rights-based prevention and toward population-based, dehumanized, and medicalized prevention. This shift has reconstructed HIV as a concept that can only be addressed by "objective" medical experts and does not allow for the meaningful incorporation of the experiences of people living with HIV (Patton, 2011). Other scholars have emphasized that the implementation of TasP has come with increased medical surveillance and regulation, while also transforming the subjectivity of people living with HIV as the language of "undetectability" has been taken up on a community level. While this splitting of HIV subjectivity has entailed the reduction of stigma for "undetectable" individuals, it has only intensified stigma for those who are still "detectable" and has occurred against the backdrop of increased HIV criminalization (Guta, Murray, & Gagnon, 2016).

Among more supportive scholars, concerns about the overall *effectiveness* and successful implementation of NPTs on a broader population-level also persist within the HIV sector (Young & McDaid, 2014), highlighting the necessity of continued thoughtfulness in the application of these new strategies. Various scholars have discussed how the wide-scale implementation of antiretroviral therapy has contributed to both HIV *transmission optimism* – confidence placed in the reduction of HIV transmission risk during sex due to improved interventions – and *treatment optimism* – a perceived reduction in the health ramifications of HIV infection due to improved treatments (Kalichman et al., 2007; Prestage et al., 2012). Other scholars have highlighted the concept of risk compensation, or an increase in high-risk sexual behavior and/or reduction in condom use due to a perceived reduction in transmission risk, as a major cause for concern (Golub, Kowalczyk, Weinberger, & Parsons, 2010; Brooks et al., 2011).

As community-based and public health-directed HIV prevention efforts continue to incorporate PrEP, PEP, and/or TasP, education has shifted to include NPTs as well, thus adding to the combination of HIV prevention strategies available to gay and other men who have sex with men (Kurth, Celum, Baeten, Vermund, & Wasserheit, 2011). Major gaps remain in this educational process, however, as rates of NPT awareness have varied substantially across contexts and depending on the specific intervention in question. For example, levels of non-occupational PEP (or nPEP) awareness have typically been high among gay men in Canada and the US with most studies >50% (Lin et al., 2016; Mayer et al., 2016; Waldo, Stall, & Coates, 2000). In contrast, levels of awareness for TasP and PrEP have shown more regional and temporal variation, and have been lower than levels of PEP awareness in general, although, in the case of PrEP this has changed as tenofovir-emtricitabine (TDF-FTC) has gained federal drug approval in various jurisdictions (Golub et al., 2010; Grant et al., 2010; Holt, 2013; Holt, Lea, Kippax, et al., 2016; Kellerman et al., 2006; Krakower et al., 2012; Lachowsky et al., 2016; Mayer et al., 2016; Young et al., 2015; Young, Flowers, & McDaid, 2014; Young & McDaid, 2014).

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Additionally, several studies have indicated that the degree of NPT knowledge provided to gay men is fragmented and partial at best, even within high-awareness contexts, and that this incomplete knowledge is a major barrier to the successful implementation of NPTs (Brooks et al., 2011; Galindo et al., 2012; Holt M, Lea T, Kippax S, et al., 2016; Nodin, Carballo-Diéguez, Ventuneac, Balan, & Remien, 2008; Young, Flowers, & McDaid, 2015). For example, rates of TasP awareness in Vancouver are nearly 50%, though assessment of participants' deeper knowledge found that only 14% had a complete understanding of this strategy (Carter et al., 2015). Misconceptions can be prevalent and persistent, such as the conflation of PEP and PrEP and the characterization of PEP as a "morning after pill" (Nodin et al., 2008; Saberi et al., 2012; Waldo et al., 2000).

Crucially, many barriers have also been cited in terms of NPT acceptability, defined here as the continuous decision to use a particular intervention despite the existence of alternative options (Young & McDaid, 2014). PrEP is indicative of this gap as awareness and willingness to use PrEP among gay men may be high (Galindo et al., 2012; Mehta et al., 2011; Young et al., 2014) while still resulting in very low rates of actual use (Mayer et al., 2016). Barriers to PEP acceptability are numerous, with inadequate risk perception, various social barriers, and the unwillingness of health care providers to prescribe listed as challenges (Gair, & Jollimore, 2012; Mayer et al., 2016; Nodin et al., 2008). Attempts to gauge PrEP acceptability have also been less encouraging with concerns about adherence, cost, side effects, perceptions of effectiveness, and perceptions of HIV risk being cited (Brooks et al., 2011; Galindo et al., 2012; Mayer et al., 2016; Wade Taylor et al., 2014; Young et al., 2014). Skepticism over the efficacy of antiretroviral therapy as a means of HIV prevention and challenges in interpreting suppressed or undetectable viral loads remain major barriers to TasP acceptability, as does an emerging gap in understandings of TasP between HIV-positive and HIV-negative gay men (Holt et al., 2013; Holt, Lea, Schmidt, et al., 2016; Vanable et al., 2012; Young et al., 2015). In short, as the above evidence suggests, NPT acceptability among gay men is essential to effective rollout.

HIV-related stigma remains foremost among these barriers to NPT acceptability, with many scholars emphasizing this as a major challenge to PEP, PrEP, and TasP implementation at multiple levels (Mayer et al., 2016; Wade Taylor et al., 2014; Young & McDaid, 2014). However, few scholars have defined what they mean by HIV stigma at a theoretical level in their analyses, which is problematic given the vague, broad manner in which this term is often applied (Deacon, 2006; Link & Phelan, 2001; Parker & Aggleton, 2003). Thankfully, there is a body of literature to draw from that has theorized stigma at a deeper level. Deacon (2006) argues that we must be cautious of assuming that stigma, discrimination, and disadvantage are synonymous, since this stretches the category of "stigma" too far to include both causes (e.g., stigmatizing beliefs) and effects (e.g., sometimes discrimination and disadvantage). While stigma, a process of labelling, "othering," and negative stereotyping, always produces a loss of status for the stigmatized individual, Deacon (2006) suggests that this does not always lead to overt discrimination or disadvantage. For instance, individuals with less power in a social hierarchy may stigmatize those above them, but this is unlikely to have notable negative effects on those with higher positons in the hierarchy. Stigma may also produce other forms of disadvantage beyond overt discrimination, such as an internalization

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of inferior status that may also have powerful effects on individuals, for instance, by discouraging them from seeking out health care (Deacon, 2006).

Other scholars emphasize that research on stigma too often conceptualizes this as an individual rather than social process, and argue that stigma needs to be conceived as conduit through which power and domination are enacted through discrimination and disadvantage (Link & Phelan, 2001; Parker & Aggleton, 2003). Stigma can thus occur at various levels: internalized within an individual, expressed within relationships and individual behaviors, and on an overarching structural level. Building on this work, we conceptualize stigma as a social phenomenon that is embedded in, and reproduced through, relationships of power and occurring at multiple points. We acknowledge that stigma need not produce discrimination and emphasize instances where stigma manifested as something other than discrimination, such as internalized fears or anxieties.

It is important to note that gaps in PEP, PrEP, and TasP literacy and acceptability are highly variable and context-dependent. Since the roll-out of these prevention strategies is largely reliant on drug approval, insurance coverage, and intentional, strategic implementation by medical and public health authorities, various jurisdictions have differentially implemented, funded, and scaled-up NPTs. This has had a profound impact on how PEP, PrEP, and TasP are perceived within a given context. In Vancouver, TasP has been an actively promoted prevention strategy since 2010 and used as a primary means of decreasing HIV transmission rates and viral load levels on both an individual and population level (Anema, Lima, Johnston, Levy, & Montaner, 2009; Lourenço et al., 2014). In order to achieve this goal, and aligned with current USA-IAS treatment guidelines, antiretroviral therapy has been available free-of-charge to all individuals living with HIV in British Columbia regardless of CD4 cell count (Carter et al., 2015). In contrast, while PEP has been recommended for use within some US cities since 2005, serving as a fairly established intervention in these jurisdictions (Smith et al., 2005), a Vancouver pilot program was only started in 2012, making this a relatively new prevention option within the Vancouver context (Lin et al., 2016). Similarly, TDF-FTC was approved for use as PrEP by the United States Food and Drug Administration in 2012 but only received Health Canada approval as of February 2016 as an initial step towards wider implementation (Health Canada, 2016). As a result, between 2012 and 2014, awareness and uptake of PrEP in Vancouver remained low in comparison with the US context (Lachowsky et al., 2016). At present, PrEP in Vancouver remains an emerging technology, providing a pertinent case study for PrEP rollout, uptake, and acceptability.

While scholars agree that optimizing education acceptability is critical to successful NPT implementation (Galindo et al., 2012; Young et al., 2014), little explicit research has been conducted on how gay men are even learning about these new strategies, with few exceptions (Holt, Lea, Kippax, et al., 2016). Studies that have focused on sources of broader HIV prevention education are more numerous, but, even in this more general domain, the vast majority have been small pilot studies that have quantitatively examined the efficacy and acceptability of a single intervention platform such as online focus groups (Ybarra, DuBois, Parsons, Prescott, & Mustanski, 2014), community-directed interventions (Batist, Brown, Scheibe, Baral, & Bekker, 2013), mobile apps (Muessig et al., 2015), social media (Menacho, Galea, & Young, 2015), group-based peer education (Bavinton, Gray, &

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Prestage, 2013), or motivational interviewing (Parsons, Lelutiu-Weinberger, Botsko, & Golub, 2014). Many of these focused, singular interventions have been shown to be quite successful, but less research has been conducted on broader processes of knowledge generation from the multiple, interacting sources that many gay men likely experience in reality. One notable exception to this trend is Voisin and colleagues' exploration of the various sources of HIV prevention information utilized by gay black youth in Chicago (Voisin, Bird, Shiu, & Krieger, 2013). Based on the results of two small focus groups, four sources of education are highlighted in the study – the LGBT community, family and friends, mass media, and schools – with community-based education being emphasized as the most acceptable source. Voisin and colleagues (2013) then explore the strengths and weaknesses of each of these sources while noting the presence of various barriers to accurate and acceptable HIV information, including homophobia within participants' families and racism within the mainstream media.

We conducted a small qualitative sub-study to analyze perceptions of NPTs and other forms of HIV prevention among early adopters of these technologies in Vancouver, Canada as part of the Momentum Health Study, a prospective bio-behavioral cohort examining the impact of TasP scale-up. The sub-study as a whole aimed to examine how the introduction of NPTs had influenced the use of other forms of HIV prevention in order to add qualitative depth to our existing quantitative findings. In this particular paper, we report on our findings surrounding participants' descriptions of NPT education sources and acceptability, the continuous decision to use a particular intervention despite the existence of alternative options. In this paper's analysis, the "intervention" of interest is not the NPTs themselves, but instead the education sources and methods of these NPTs. As such, we are interested in the acceptability of various education sources regarding NPTs according to our participants, which is essential to the effectiveness of prevention education. We sought to examine the multiple ways in which gay men in Vancouver were learning about NPTs and further asked participants to articulate what these experiences of accessing NPT knowledge had been like, allowing participants to compare multiple forms of education and articulate the relative strengths and weaknesses of various prevention sources. Ultimately, we aimed to analyze how the acceptability of NPT education could be optimized within this setting.

METHODS

Participants were drawn from the larger Momentum Health Study, a longitudinal bio-behavioral prospective cohort study of 698 HIV-positive and HIV-negative gay men in Metro Vancouver, Canada (inclusion criteria: age ≥ 16, live in Metro Vancouver, identify as a man, have had sex with a man in the last six months, and able to answer a questionnaire in English) (Moore et al., 2016). The goal of the overarching Momentum Health Study is to evaluate shifts in gay men's health, sexual behavior, and substance use in response to TasP scale-up. Among its various goals, the Momentum Health Study has evaluated levels of NPT awareness and use among participants, the results of which have been reported elsewhere (Carter et al., 2015 for TasP; Lachowsky et al., 2016 for PrEP; Lin et al., 2016 for nPEP). As such, this qualitative sub-study generally aimed to provide a contextual, nuanced and deeper understanding of NPT acceptability and HIV prevention among our participants, which is outside the scope and possibility of the parent study.

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We purposively recruited HIV-negative study participants who reported prior NPT experience (use of PEP, PrEP, and/or viral load sorting – the selection of HIV-positive partners by HIV-negative individuals based on perceptions of low or undetectable viral load – as a proxy of TasP). Based on responses to the behavioral questionnaire in the larger cohort study, there were a total of 84 eligible participants who were not lost-to-follow-up. Of these 84, four had reported PrEP use, twelve had reported nPEP use, and the remaining only viral load sorting. For this exploratory descriptive study, we aimed to conduct twenty interviews. All cohort participants who reported nPEP or PrEP use in the larger study were invited to complete an interview. Participants who reported viral load sorting were recruited to fill the remaining interview spots. Eligible participants were contacted and asked if they were interested in completing an individual one-hour semi-structured interview focused on their experience and the acceptability of NPTs. Trained peer research associates (Elliott, Watson, & Harries, 2002), who were peers in terms of HIV serostatus (HIV-negative) and sexual orientation (gay, bisexual or queer), and had prior experience in interviewing HIV-negative gay men, conducted the interviews. Written informed consent was secured from each participant prior to the interview and ethics approval of study procedures were provided by the Research Ethics Boards of Simon Fraser University, University of British Columbia, and the University of Victoria. Participants were given honoraria of $50 CAD upon interview completion.

As mentioned above, the goal of this qualitative sub-study as a whole was to explore the place of NPTs within participants' HIV prevention practices and how NPTs had shifted conceptions of HIV risk. As such, the interview guide contained a series of open-ended questions regarding participants' perceptions of and experiences with various HIV prevention strategies, with a particular emphasis placed on nPEP, PrEP, viral load sorting, and condoms. The semi-structured nature of these interviews encouraged a conversational style with open-ended answers and a series of follow-up questions or prompts (Galletta & Cross, 2013). Our questions were generally aimed at discussing how participants negotiated risk and prevention within their sexual interactions. Specifically, we asked participants about their experiences of accessing and using NPTs as well as their perceptions of the strengths, weaknesses, and overall effectiveness of these prevention strategies in comparison with other forms of prevention. Additionally, participants were asked to articulate the sources through which they had learned about HIV prevention as a whole. We then asked participants about their awareness of each NPT specifically, and where this awareness came from, as well as their perceptions of the acceptability of NPTs on both a personal and community level. This particular paper examines a portion of our sub-study data pertaining to NPT education.

Interviews were audio recorded, transcribed verbatim, anonymized, and then subjected to an in-depth thematic analysis and coded upon completion of all interviews, thus allowing for a flexible yet comprehensive interaction with our data (Braun & Clarke, 2006). We utilized thematic analysis due to the flexibility and richness offered by this approach and closely followed the decision-making outlined by Braun and Clarke. We further sought to ensure the trustworthiness of our analysis by following Lincoln and Guba's (1985) evaluative framework for qualitative work, establishing credibility, transferability, dependability, and confirmability. Four readers engaged in the inductive, semantic, and essentialist/realist generation of a master code list based on multiple readings of the interview transcripts, with

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frequent discussion and comparison to ensure consistency and consensus in code application. This ensured an iterative, inductive, data-driven engagement with our interviews and supports the validity of our findings. We attempted to code for all themes present in the interviews rather than requiring a threshold number of mentions within or across interviews to be considered a code. All interviews were coded by at least two readers using track changes in Microsoft Word, and discrepancies were rectified in weekly meetings to further ensure reliability. Codes were revised and expanded as needed – and interviews thus recoded as this scheme developed – through an iterative engagement with the data before being grouped and sorted into themes and sub-themes in Microsoft Excel. Ultimately, fifty codes were generated and defined, with several of the codes pertaining to specific sources of education, which form the basis of the present analysis. Nine coding groups were identified, specifically “Feelings/Emotions,” “Sources of Education,” “Prevention Practices,” “Sexual Practices,” “Risk,” “Substance Use,” “Treatment and NPTs,” “Personal Context,” and “Temporal Change.” The first two of these themes form the basis of this analysis.

RESULTS

Nineteen interviews were conducted, with an average length of 65 minutes and a range of 27 to 133 minutes. As our interviews varied immensely in length, only fifteen of these interviews are reported on here; the remaining four did not provide a rich or deep discussion of the themes under analysis in this paper, although they did touch on other themes that are not as relevant to the present analysis (ranging from condom use to self-esteem) that will be reported on elsewhere. Of these fifteen participants, eight had used PEP, two were PrEP users, and seven were using viral load sorting as a prevention strategy (two had used both PEP and viral load sorting). Participants’ ages ranged from 22 to 58 years of age with an average age of 38 years (median = 36). Participants’ quotes include their reported age while a pseudonym is used to ensure anonymity and confidentiality.

Thematically, this paper will briefly analyze our participants’ levels of NPT awareness and knowledge before moving on to a predominate focus on our participants’ experiences of NPT education and their perceptions of educational acceptability. We will also explore various specific sources of education – including the Internet and print media, health care providers (HCPs), community organizations, sexual partners, and peers – as sub-themes that emerged over the course of our interviews. In cataloguing these various sources, we will discuss both more self-motivated forms of NPT information-seeking – through the Internet and HCPs instance – and more social forms of education – groups, partners, and peers – paying special attention to our participants’ perceptions of the benefits and limitations of these individual outlets. We will then discuss the active and informal role our respondents occupied in educating peers as a final theme that emerged iteratively within our data, emphasizing education as a dynamic, two-way process.

Levels of Knowledge and the Importance of Education

Since previous experience using NPTs was an inclusion requirement for this sub-study, all participants had some awareness of PEP, PrEP, and/or TasP. However, individual participants’ depth of knowledge surrounding NPTs varied immensely due to differing

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access to NPT knowledge that is shaped by structural systems. While some participants were provided with deep knowledge of the nuances of these strategies, others were not provided with this depth and could not fundamentally understand or distinguish between NPTs as a result. Participants commonly confused PEP and PrEP and failed to distinguish between them. For example, Justin (age 34) indicated "…with regards to PrEP and PEP, sorry, I always get that mixed up, there isn't a great deal of information that I've been exposed to. So yeah, I would like more knowledge on that." Similar statements of incomplete knowledge are common throughout the interviews, indicating that awareness – and even use – does not necessarily indicate broader knowledge. Likewise, many participants were unfamiliar with or uncertain of the term "treatment as prevention" despite frequently making decisions around sexual risk based on viral load sorting. When asked if he had utilized TasP before, Wade (age 26) stated "…yeah, oh - what is that again? It's - yeah, just getting testing a lot and?" This confusion over terminology did not always indicate a lack of knowledge about NPTs, but rather implied a lack of familiarity with public health jargon indicating that participants were either learning about NPTs elsewhere or were failing to retain common public health "branding" and acronyms, using different language in their understandings of prevention instead. Indeed, participants frequently demonstrated their depth of NPT knowledge and awareness of recent research in their discussions of applying NPTs in various complex, practical contexts, even highlighting gaps in existing research. For instance, Michael (age 49) wondered about the theoretical risks implicit in intermittent PrEP use:

> "I'm kind of wondering like if you could take it for say, you know, you knew you were going to some big Pride event or whatever and you can take it before and during. And then say you were coming home and you were not going to be expecting to be at risk… could you like go off of it for like nine months and then go on it again, on and off sort of thing?"

Another participant wondered if it was possible for a PrEP user to transmit HIV from one partner to another without personally seroconverting, further emphasizing gaps in our participants' basic HIV knowledge and the disconnect that exists between research dissemination and application. Thus, participants were generally provided with high levels of NPT awareness but varying levels of contextual knowledge.

Participants consistently emphasized the importance of NPT knowledge, seeing self-education as an empowering and critical element of their overall approach to prevention. As Ryan (age 46) described, "…for me to take care of myself, prevention means to be constantly just reading up on things, hearing stories from other people, and then just basing my decision on being as informed as I can." According to Ryan, increased knowledge allows for better sexual decision-making and thus improved prevention. This perception of NPT knowledge was echoed by other participants, such as Michael (age 49), who stated "… certainly I would like to be more fully educated in terms of how the drugs work and what treatments are available. Knowledge is power, right?" While many participants described learning as a largely self-motivated and active process of engagement with prevention information, others questioned the efficacy of the self-directed approach. Nick (age 46) called for "…some way to get the medical breakthroughs, the latest information out there to

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us in a nearly effortless way, otherwise people aren't going to bother to keep up with it," expressing the structural limitations placed on individuals' capacities to consistently seek out knowledge for themselves.

The Internet as a Source of NPT Education

Given the value placed on self-education, it is not surprising that many participants emphasized the Internet and print-based media as major sources of NPT information. Ease of access was frequently cited as a major benefit to these education sources. Participants indicated that they often searched online to learn about unfamiliar concepts and terminology and facilitate self-education. As Jose (age 30) summarized in reference to HIV prevention, "…once I see something and I don't know what it is I just Google it and try to figure out what it means, what it's like." Other participants indicated that the Internet offered an alternative to mainstream NPT coverage, providing information that was unavailable through other sources. Oscar (age 51) recalled learning about PrEP online and "…being shocked about why the hell isn't this front page news, that there's this drug now that - it was almost… like a cure." This perspective on internet-facilitated PrEP knowledge was reiterated by Tyler (age 36), who stated that he had also learned about PrEP through alternative peer-driven social media sites: "…it's all part of the secret handshake thing, right? Like, you have to sort of know somebody who knows about this Facebook group and, and join it… there's not sort of good organized sources of information on this." In addition to the Internet, participants highlighted the role of queer print-based media in NPT knowledge transmission, particularly around PrEP again. For instance, Vince (age 41) stated that he had "…never even heard of the 'pre- one' until… probably a year ago… Yeah it was, it was [in] Xtra West."

However, participants were also quick to point out challenges in using the Internet as a source of NPT information, particularly emphasizing the difficulty of finding accurate, high-quality information online. Speaking about how he learned about viral loads, Tyler (age 36) stated that "I must have Googled it quite frankly, which is like… then you have to sort out the results you get from Google to see what seem reliable." Participants thus emphasized that not all online sources are equally valuable or reliable. Travis (age 48), for instance, noted his trepidation in trusting gay sources of NPT knowledge online because "[They're] not really good. They don't analyze things very well and everything is touted as being the latest or… there's always an emotional spin on it. So, I usually go to things like… more the health care oriented stuff." While some participants suggested that emotionally-geared Internet sources were hard to trust, others paradoxically argued that online NPT information was too impersonal and purely factual to be effective. Speaking about online sources, Logan (age 22) argued "…they're all facts. And that doesn't really communicate anything to anyone. You want emotion, you want experience, that's really the only way people learn, or I find is the best way people learn." Still other participants articulated the challenge of interpreting technical medical information online, especially pertaining to the complexities of NPTs. While noting the positive exception of the online resources produced by Health Initiative for Men, a local gay community organization, Owen (age 25) stated that most HIV-related websites could be very confusing: "For me, what I find, when they're trying to

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explain like, what is, like, your risk for this, this big act… this many variables is just so hard to interpret so it's eas[ier] to talk to someone."

Health Care Providers as Sources of NPT Education

In addition to the Internet, participants also emphasized healthcare providers (HCPs) as a major source of NPT information. Many participants stressed the expertise and trusted knowledge offered by doctors and nurses, and the ability to ask questions and interface with these experts within the health care setting, as major benefits. These strengths are summarized in Owen's (age 25) experiences with sexual health nurses:

> "I always tend to have a new question about prevention tools about like everything to what does this do. I'm like, what are the risks of this? What are the truths of this, what about this, what about this? I always tend to find like subject matter there. I mean, they're experts or what I perceive as medical experts."

Thus, in contrast to the Internet, HCP education allowed for questioning and clarification within an interactive context mediated by experts, which is especially important given the increasingly medicalized, NPT-driven prevention context that has emerged in recent years. Participants also indicated that HCP education was convenient since NPT information could be accessed while seeking out practical treatment through this medium. For instance, Wade (age 26) notes that his knowledge of PEP was largely generated while accessing PEP through his HCP, stating that "…for about a month there, that's you know, regular visits and you find out pretty much everything you need to know." In this sense, the experience of seeking out NPTs through HCPs can be a powerful and practical source of NPT information accrual.

Despite the strengths of HCP education, participants emphasized the limitations of this source of information to a greater extent. For example, Kevin (age 51) stressed the impersonal, heteronormative nature of HCP interactions as a challenge, suggesting that subtle forms of sexual orientation-based stigma coloured this environment:

> "…it's sort of like a heterosexual world like when you walk into a hospital looking for that, they sort of don't treat you, they treat the symptom, right… But it was always medical, it was never like the social/emotional and when we were at the hospital, like we had to wait forever."

This depiction of the medical field as a "heterosexual world" also contributes to the portrayal of HCPs as being insensitive to gay issues, rendering this source of information less acceptable to gay men who may internalize this stigma and therefore be less likely to approach medical experts. Many participants highlighted this perceived insensitivity and stressed feelings of discomfort in disclosing their sexual orientation or sexual behaviors to their doctors, further indicating the presence of stigma on an internalized level. Others noted overtly negative interactions with their HCP. For instance, Connor (age 26) recounted his experience of asking his doctor about STI testing and prevention, depicting this interaction as homophobic and discriminatory:

> "So I was saying, well what do I do about this and his reaction was kind of negative. He said, well, oh if you're having sex with women then just kind of like

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> six months or a year but, and I don't remember exactly what he said but he made some kind of comment like, if you're having like, you know, dirty man sex or something along those lines, then you need to get tested all the time. Just the way he talked about it, and so that was the last time I ever saw him, you know?"

Connor's response shows the intricate ways in which HIV-related stigma and homophobia could coalesce in interactions with HCPs, producing dramatically discriminatory results at times. Additionally, participants indicated that many HCPs lacked precise NPT knowledge and were thus not experts in this domain. Oscar (age 51) expressed his frustration that his doctor had so little knowledge about PrEP access and efficacy studies, concluding with "I don't want to have a doctor that I'm schooling." Nick (age 46) highlighted the challenge and necessity of asking well-formulated questions in order to gain useful information from HCPs:

> "…if I know of questions to ask, they're good at answering them, but they're not good at providing that information when I may not even know that I need it. Like the detectability stuff I'm sure has been out there for a while and it wasn't until somebody wanted to do that with me and brought it to my attention, that I was even aware of it. It didn't come from my doctors…"

According to Nick, HCPs are a useful source of NPT information but may not provide an ideal starting point as their dissemination of information is often limited by patients' abilities to formulate adequate questions, thus requiring pre-existing knowledge of complicated NPT terminology and application.

Community-Based Organizations as Sources of NPT Education

While participants were fairly critical of HCP education as a whole, education through queer-sensitive clinics and sexual health nurses was more positively perceived. The HCPs at the Qmunity and Health Initiative for Men (HIM) health centres along with the Infectious Disease Clinic at St. Paul's Hospital were specifically emphasized as strong sources of prevention information. Participants emphasized that HCPs at these locations had greater degrees of NPT expertise and encouraged overt discussions of gay sexual practices without heteronormative bias, thus vastly improving the dissemination of prevention knowledge. As Michael (age 49) notes, information from these HCPs directly catered to gay men, allowing for relevant information such as

> "…the statistics on, you know, your chances are so many in 10,000 or whatever if you're a top versus a bottom, that sort of thing. You know, whether you're using a condom and whether you're not using a condom, and learning about, you know, the things like if you have sex with somebody who's HIV positive but it is undetectable, the risk is, you know, probably less than somebody who isn't quite sure if they're HIV positive…"

As other participants note, this expertise about gay issues encouraged gay men to have franker, more open discussions with doctors and nurses, providing deeper, increasingly comfortable HCP interactions. For example, Connor (age 26) recalls how he gathered information upon entering a serodiscordant relationship: "I had a lot of questions about being in a, you know, positive-negative relationship. So I talked to a couple of nurses at

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[HIM]. I talked to a couple at Qmunity." Participants also portrayed community-based HCPs as being more accessible and convenient due to their proximity within the West End – Vancouver's gay community neighborhood – and the simplicity of not having to get a requisition for testing from a doctor when visiting one of these clinics.

In addition to community-based health clinics, participants highlighted other forms of community education – such as the programs, outreach groups, and campaigns run by HIM and Qmunity – as contributors to NPT education. As with community-based clinics, a major strength of this form of education is that its nuanced and queer-specific messages are crafted particularly for gay men. Community-based health campaigns provide the clearest example of gay-specific messaging and multiple participants spoke about the campaigns run by HIM as being important elements of prevention education. As Tyler (age 36) notes, "HIM has done a series of good campaigns… They tend to - which I think is smart - choose one or two messages that they want to get out there, [and] they're reasonably effective at doing so." Other participants stated that much of their prevention knowledge came through their interactions with these organizations, via print campaigns and group involvement. Furthermore, participants indicated that they saw the information provided by community organizations as authoritative and reliable, in contrast to online sources for instance. When asked about where he had generated his knowledge around condoms, PrEP, and prevention, Connor (age 26) articulated:

> "…growing up with computers and stuff like that, it was all kind of accessible but the resources weren't as clear. I mean, it's a lot easier to understand when you're talking to somebody about it. It's a lot different than Googling what these things mean. Then, you never know if you're getting factual information or not. So, I learnt the most through local queer sources."

Nonetheless, the limitations of this source of education were also strongly expressed by some participants, especially in terms of funding and geographic reach, as Tyler (age 36) indicates:

> "…the effectiveness of one non-profit organization's campaigns is… limited to the budget and what messages they're able to send in any given time, and it's also really limited by the reach of those kinds of campaigns… so when you're downtown you see bus ads and billboards and, and posters and things, and of course it's much harder to reach people… outside of downtown."

Overall, community-based education was generally seen as a valuable source of NPT education, albeit one with some addressable limitations.

Sexual Partners and Peers as Sources of NPT Education

Sexual partners provided another frequently cited source of NPT information for several participants, occasionally playing a crucial role in prevention education. For instance, Damian (age 25) stated that for PrEP, "…all of my knowledge from it has been strictly through men that I've had sex with," while another participant indicated that he strongly relied on his long-term partner for prevention information. As these examples imply, one strength of partner-based education is its ease of access, providing learning within the

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context of organic, pre-existing sex-seeking and relationships. Additionally, participants indicated that interactions with partners could provide a catalyst for further information-seeking around NPTs. Owen (age 25) recounted his first conversations with an undetectable partner (i.e., an HIV-positive partner who is on antiretrovirals and has a reduced viral load, thus making them much less likely to transmit the virus) and how this encouraged further education:

> "[I] knew a bit about it [undetectability] but didn't really know about it… I would talk because I actually wanted to get more informed myself, personally, and I did. I think the reason for that one was I just really liked this guy and the way he was presented to me… I was like, hmm, maybe I should actually look into this for real now... So that was that particular person, in person, just happened to be, I kind of got that push..."

However, participants also articulated several drawbacks to partner education. Despite generating much of his PrEP knowledge through sexual partners, Owen (age 25) stated that "…it's tough because… I don't see them as subject matter experts. It's more of just a prompt to get more information." Thus, while serving as a catalyst for further seeking-out of NPT information, interactions with sexual partners might not offer reliable information independently, further hinting at the growing complexity of prevention information in the NPT era. Additionally, participants suggested that the trustworthiness of information provided by partners could be complicated by ulterior motives associated with sex. Speaking about his positive undetectable partner, Nick (age 46) stated "I'd just met him and, you know, men will say things to get what they want, and so I didn't outright disbelieve him, but I wanted to make sure that this stranger was telling the truth." As other participants note, this issue of trust is compounded by the stigma and challenges associated with status disclosure and being HIV positive, as the positive partner may fail to disclose their status due to feelings of inferiority and fears of discrimination resulting from stigma. Another barrier to partner education according to participants was that it was hard to bring up in the heat of the moment surrounding sex, since explicit conversations around sexual health were typically viewed as "unsexy" and interrupted the flow of a given sexual encounter. For instance, when asked if he frequently engaged in conversations about prevention, Travis (age 48) said "Not with people I'm prone to have sex with immediately… it's not conversation you want to particularly be having right before jumping in the sack."

Non-sexual relationships (i.e. peers and friends) were mentioned more frequently than sexual partners as sources of NPT education. Participants recalled learning about HIV prevention from their friends, such as Connor (age 26): "I talked to friends who had been in similar situations. I talked to some of my poz friends. So there were a few resources that I used in terms of learning about HIV." In contrast to partner education, participants noted that peer education was free from the constraints of a sexually-fueled environment and was therefore more comfortable. For instance, Owen (age 25) noted his reluctance to "probe" an HIV-positive partner about undetectability while indicating his openness to having these discussions with his HIV-positive friends: "…it was a nice chance to actually get to talk to them very detailed about what it means and not, and they're very comfortable about it versus that one guy, like, I only slept with him a few times." Additionally, participants indicated

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that conversations with peers could be used as a means of nuancing understandings of NPTs by gathering and comparing multiple perspectives. As Tyler (age 36) put it, conversations with peers "…can also be a way of sometimes sifting through information to see… what has my friend heard and what was their assessment of what they read, and you start putting the pieces together that way." Most importantly, participants indicated that the personal testimony of peers offered a means of humanizing NPT information, converting cold facts into applied, practical knowledge. Thus, as Ryan (age 46) suggests, factual knowledge often required the practical or personal lens offered by peers in order to be understood fully: "I think that reading about it [PrEP] was just gathering information; talking about it and hearing stories from people, it's given me a range of opinions and feelings about it [in relation] to myself."

Barriers to peer NPT education were also mentioned by participants, foremost amongst these being persistent stigma surrounding HIV and antiretroviral treatments. While stigma was not solely limited to peer education, this barrier provided a major challenge to casual conversations about HIV and prevention, thus having a particularly prominent effect on education through peers and partners. When asked why he thought other gay men were unwilling to use TasP, Damian (age 25) articulated this stigma well, stating "…there's the stigma of just like fear, like you hear that word 'HIV' and then you kind of don't listen to undetectable or viral load count or like what that even means." Stigma was also prevalent in discussions of PrEP use, as Tyler (age 36) notes: "…there's a perception that people who are on PrEP must be horrible sluts who have an awful lot of unsafe sex and possibly are doing crystal meth or… other sorts of things." Indeed, some participants argued that the stigma surrounding PrEP and HIV needed to be addressed in order to improve NPT knowledge and acceptability within the community. As Tyler continues, "… [it] would be amazing… if [the] roll out of PrEP as a more organized public health policy in BC… could be done with… a way of mindfully avoiding or defusing some of the stigmas that we've seen elsewhere." Our participants thus recognized that stigma manifested in a variety of ways in interactions with peers but also articulated that such stigma need not lead to disadvantage if adequately confronted.

Stigma was not the only barrier to peer education noted by participants either as Damian (age 25) suggests that "… [prevention] can be a dry subject or something people don't want to talk about or something that people don't want to necessarily vocalize their opinion on… in a social setting." In short, discussions about NPTs were not always socially suitable due to the perceived difficulty and dryness of this topic. Moreover, participants indicated that information from peers might not be factually accurate or complete. Thus, as Tyler (age 36) describes, factual knowledge was necessary to add the nuance, depth, and expertise lacking in most personal accounts: "…people talking about things in conversation arouses interest which then needs to be supplemented with actual factual material, you know, that's been written by people who know what they're talking about. But you really do need both, I think."

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Participants and "Peers as Educators"

In addition to being on the receiving end of NPT education, many participants also identified themselves as informal educators of their peers, thus playing an active role in the educative process. Indeed, due to our recruitment of early NPT adopters, participants were in an array of education, support, and advocacy roles. For example, Logan (age 22) discussed being a prevention information resource for his friends: "…my friends are always asking me sexual health questions… [PEP] is just another kind of treatment method that a lot of people haven't had to deal with. And so yeah, I've told a lot of friends about the experience." Many participants mentioned similar instances of playing an active role in education, sharing their experiences with and knowledge of NPTs with friends and partners.

However, participants' prevention efforts were not limited to providing information, as many noted a deeper level of support, engagement, and advocacy in their interactions. This deeper engagement could include taking friends or partners to sexual health clinics for STI testing or the emergency room to access PEP. Michael (age 49) described his rationale for this support:

> "I've had guys who [said] … I don't know where is the clinic and I don't know about some of these risks and I say 'hey do you want me to go with you to the [clinic]? So you can get tested and ask?' and I have. I'm more than happy to, right? Because I know how much it put me at ease…"

Beyond these education and support roles, participants advocated for the efficacy of prevention strategies and the health of their peers. For instance, Tyler (age 36) described how sex-seeking as a PrEP user could easily shift to endorsing PrEP effectiveness and encouraging certain at-risk individuals to seek access to it:

> "…sometimes it won't be a question of finding [a] new sexual partner, but it may be a question of discussing with someone who is at-risk and ought to be on PrEP, but has no idea how to do it… I'm happy to have those conversations with people, partly because I wish that I had had someone to have that conversation with, so you can kind of pay that forward a little bit."

Furthermore, participants advocated for increased community support and dialogue around NPTs to improve prevention education. For instance, Logan (age 22) suggested that "I think in educating people, [we need to] creat[e] a space where people can openly talk 'cause people aren't doing that… we need more spaces to communicate with each other." This advocacy of communication and support was further emphasized by Damian (age 25) in relation to HIV prevention:

> "I don't think that [HIV] should be something that we should be afraid of in any way; in fact we should be liberated with the advances of where HIV sciences and studies have come since our first introduction to it back in the eighties. And instead of letting [HIV] be something that like we're afraid of, you know let's fight it with our education, communication and really be banding together as a community."

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Thus, participants emphasized that prevention education was a two-way street as they shared their experiences as recipients of NPT knowledge while also emphasizing their own abilities as informal educators and health advocates.

DISCUSSION

Our participants, who were HIV-negative gay men in Vancouver, learnt about and engaged with NPTs through a wide variety of sources, including the Internet, health care providers, community organizations, partners, and peers. They articulated the respective strengths and weaknesses of each NPT education source, and emphasized differences in the type of information provided and when each was accessed. For example, a gay man might gain rudimentary awareness of PEP from a peer, community organization, or online forum prompting an attempt to access PEP; his resulting interactions with sexual health nurses or doctors generate a deeper understanding of PEP, which is then shared with his friends and sexual partners, bringing the education process full circle. Alternatively, a gay man may first hear of PrEP from a sexual partner and turn to the Internet for further information. While the exact chronology of education sources varied amongst participants, these examples indicate how multiple sources of NPT information fit together, complement each other, and are utilized by gay men to optimize NPT education acceptability. These multiple education sources further highlight the numerous intervention opportunities available in public health promotion efforts across various mediums and temporal points.

Our results echo the findings of Brooks and colleagues (2011), who advocate for the presence of PrEP users' testimonials to facilitate PrEP adoption. We also build on the work of Voisin and colleagues (2013) in their emphasis on HIV prevention information of both a factual (e.g. mass media and schools) and more personalized (e.g. queer organizations and familial connections) nature. Study participants utilized multiple education sources in generating their overall prevention knowledge and stressed the importance of combining detailed information with personal testimony from partners and peers. Participants emphasized that pure factual knowledge found on the Internet or through medical resources could be difficult to understand, interpret, and apply. However, just as Voisin and colleagues' participants worried about misinformation in familial sources of HIV prevention knowledge, our participants expressed concern over the lack of expertise possessed by their partners and peers, especially given the nuanced and challenging nature of NPT knowledge. In short, information was easily located through these various mediums, but finding "good" information was challenging; this issue of quality when seeking health information has been identified as a common problem across health settings (Champlin, Mackert, Glowacki, & Donovan, 2016). Thus, combining factual evidence with relatable experience optimized the acceptability of NPT education, further highlighting the necessity of a combined approach to education and the need to humanize resources accessed through health care providers (HCPs), the Internet, and community campaigns.

While our participants valued quality and ease of access within NPT education, they had difficulty finding both of these values in one place and generally had to balance access against perceptions of quality in various situations. For example, while most participants lauded the accessibility of the Internet as a source of information, they also questioned the

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reliability and depth – and thus perceived quality – of most of the resources they found online. This finding is not unique to our analysis as Muessig and colleagues (2015) have also stressed the accessibility and inconsistent quality of web-based prevention platforms within the Chinese context. On the other hand, HCPs might provide expert NPT information but the stress of visiting a doctor in an environment perceived as impersonal and heteronormative presented additional barriers, thus rendering this source of information less accessible. These additional challenges to HCP access have been noted by other scholars (Brooks et al., 2011; Galindo et al., 2012; Mayer et al., 2016). According to Voisin and colleagues (2013), as well as our own participants, gay community-based organizations, like HIM, may provide an exception to this balancing act in providing high-quality information with minimal barriers through their HCPs and health awareness campaigns. As participants noted, however, geographic constraints often limit the accessibility of these resources to the metropolitan areas where these organizations are based. These examples indicate that additional sources of NPT education need to be developed that are both accessible and high quality; combination and integration of various approaches, with their associated strengths and weaknesses, may provide a means to this end. This is especially important as prevention messaging continues to shift away from established, relatable safer sex messaging – such as condom use – and towards complex, medicalized forms of prevention – such as viral load sorting (Patton, 2011).

Stigma related to NPTs, both in terms of overt forms of discrimination and more subtle forms of internalization, was apparent in our participants' accounts of homophobic, ignorant interactions with HCPs, and also manifested in conversations with partners and peers about PrEP and HIV, thus severely limiting the acceptability of NPT education on multiple levels. This finding is consistent with the persistent stigma highlighted by various other scholars in studies on PrEP, PEP, and TasP acceptability (Underhill, Operario, Mimiaga, Skeer, & Mayer, 2010; Young & McDaid, 2014), including the stigma of being on HIV-related medications and disclosing high-risk behaviors to HCPs (Mayer et al., 2016; Wade Taylor et al., 2014). While some of this stigma was linked specifically to HIV and NPTs, other aspects were related to broader structural forms of stigma, such as homophobia in interactions with health care providers. This also resonates with the work done by Logie and colleagues (2011) on the multi-level stigma experienced by HIV-positive women in Ontario that extends far beyond HIV-related stigma to include various intersecting experiences of stigma due to gender, race, and sexual orientation, among other factors (Logie, James, Tharao, & Loutfy, 2011). Thus, stigma needs to be combatted on various levels. For instance, in the short-term, Underhill and colleagues suggest that PrEP stigma could be countered directly through a combination of discrete packaging, awareness campaigns, and careful marketing (Underhill et al., 2010). Future research on HIV- and NPT-related stigma would also do well to improve the conceptual clarity of this term and how it relates to discrimination and disadvantage, since a clearer conception of what stigma is (and is not) will allow for better measurement of it and, therefore, better-targeted interventions that can combat stigma at the various levels of its occurrence (Deacon, 2006). Internalized forms of stigma that do not necessarily manifest as overt discrimination must also be combatted in order to improve the acceptability of NPT education.

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Large-scale, acceptable NPT implementation will ultimately require prolonged engagement with and sustained deconstruction of HIV and PrEP stigma that addresses this problem at its social and structural foundations, while also combatting overarching structures of marginalization centered on sexual orientation and race, for instance. This is especially true given Link and Phelan's (2001) emphasis on stigma as socially-produced and their suggestion that stigma in general needs to be confronted at the level of deeply-embedded relationships of power, not just at the level of individual beliefs or behaviors (Parker & Aggleton, 2003). This may entail challenging broad stigmatizing discourses, such as homophobia and sex negativity. Our findings suggest that increasing community support and transparent prevention dialogue are important aspects of this long-term solution. Bavinton and colleagues emphasize that building community can be a major facilitator to prevention education, as connection with other gay men is a prime motivator for enrollment in HIV education programs (Bavinton et al., 2013). Community support can also facilitate NPT acceptability and use, as Wade Taylor and colleagues (2014) suggest that belonging to a preventative community of men combatting the spread of HIV motivates PrEP adoption. Our participants stressed the need for supportive spaces and frank prevention conversations in order to improve NPT awareness and acceptability, arguing that prevention needs to be an open, accessible, and frequent conversation piece instead of a stigmatizing, off-limits topic.

This emphasis on communication illustrates the high value our participants placed on informal education from partners and peers, and the necessity of peer support to effective and acceptable NPT education. Indeed, the consistency with which our participants mentioned peer support, often in the form of community outreach groups, illustrates the importance of this medium within future prevention research. In this sense, we echo Bavinton and colleagues' (2013) emphasis on the efficacy of peer-led workshops in expanding sexual health literacy and prevention knowledge as well as Batist and colleagues' (2013) advocacy for community-based prevention efforts in providing prevention information and social support. In Vancouver, this emphasis on peer-led, community-based education and support efforts is already explicit in much of the Health Initiative for Men's work as well as in other formalized community programs such as MpowermentYVR, a peer-led education and support group for young gay, bi, and queer men. Thus, peer education, prevention conversations, and support need to be encouraged and fostered within the community, as this will likely expand awareness and use of NPTs. HIV prevention work with groups other than gay men, as well as health interventions in other realms, would benefit from this peer-led, community-based model that fosters empathy and the mutual construction of meanings and identities, as has been emphasized by other scholars (Kingod, Cleal, Wahlberg, & Husted, 2017; Convey, Dickson-Gomez, Weeks, & Li, 2010).

Early adopters of PEP, PrEP, and TasP, such as the ones we interviewed, appear to have a particularly important role to play as educators and support pillars in the expansion of NPT education. As Rosser and colleagues (2011) emphasize within the context of Internet sex-seeking among gay men, early adopters play an important leadership role in establishing norms within emerging technologies. Moreover, as Bertrand (2004) argues for behavioral change in general and safer sex particularly, under the diffusion of innovation model, a small group of early adopters may have a profound impact on population-wide sexual behaviors. Just as early gay male adopters of the Internet shaped the norms surrounding online sex- and

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pornography-seeking and early safer sex advocates shaped norms around general sexual behavior, we speculate that early adopters of NPTs will greatly influence the establishment of norms around PrEP, PEP, and TasP use and acceptability. As such, community organizations will have an important role to play in supporting and amplifying the voices of early NPT adopters in order to share educational responsibilities and minimize early adopter burnout.

Future research, including quantitative study, would be strengthened by examining NPT education within the context of health literacy – or an individual's ability to find, understand, utilize, and communicate information – as this will likely offer a more comprehensive, multifaceted view of education and knowledge gaps compared to analyses that only emphasize awareness (Champlin, Mackert, Glowacki, & Donovan, 2016). For example, while many quantitative studies provide data on rates of NPT awareness (Lachowsky et al., 2016; Lin et al., 2016), other studies show that large gaps may exist between levels of awareness and actual understanding (Carter et al., 2015). Effective implementation will necessarily require gay men to not just be aware of NPTs but also understand and apply these concepts, so shifting to a literacy lens in future research may reveal critical knowledge gaps that will need to be addressed in order to improve NPT implementation. Research on how various education mediums can be better integrated and utilized by HCPs, public health officials, and community-based organizations is also needed to improve dissemination of prevention information. Additionally, future work should embrace a community-based approach to research, ensuring that the most relevant, salient, and topical questions within the community are being answered, as these are the questions most likely to drive impact, change, and increased acceptability (Underhill et al., 2010; Vanable et al., 2012; Young et al., 2015). In short, as Galindo and colleagues (2012) have emphasized, researchers should pay attention to the uptake concerns and knowledge gaps emphasized by potential users, such as questions of intermittent or on-demand PrEP use, and attempt to address these practical issues as much as possible.

This study also has various implications for HCPs and community organizations alike. While participants lauded the work of community-based sexual health centres, they were often critical of doctors and mainstream medical services, advocating for improvements in queer competency and NPT knowledge amongst HCPs to broaden accessibility and address the practical concerns of adopters (Brooks et al., 2011; Galindo et al., 2012; Mayer et al., 2016). Our findings indicate that mainstream HCPs should work more closely with frontline HCP personnel, such as nurses, social workers, and counsellors within the gay community, who may possess greater competencies and specific expertise around gay men and HIV prevention. Working with these frontline personnel might provide a means of humanizing gay men's HCP experiences and addressing barriers and motivations on a personalized level (Wade Taylor et al., 2014). It would also improve knowledge translation due to frontline HCPs' pre-existing experience in communicating with gay men, especially when combined with a focus on sexual health literacy (Young et al., 2014). As other scholars note, the acceptability of HCP-based NPT education may be further improved by packaging NPT information as part of a holistic, integrated approach to health along with broader prevention education, STI testing, and counseling (Galindo et al., 2012; Vanable et al., 2012).

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Considering practical financial constraints and the popularity of the Internet amongst our participants as a source of NPT information, community organizations should utilize their knowledge translation skills to produce strong online prevention resources that are accessible to a wider geographic audience (Bowen, Williams, Daniel, & Clayton, 2008). The use of an online education platform is particularly efficacious given the proportion of gay men who are already using the Internet regularly for sexual and social connections and the proven effectiveness of online prevention platforms in reaching marginalized groups, such as Indigenous men, men living with HIV, and lower income men (Brennan et al., 2015). Location-based social marketing campaigns, on billboards and in traditional gay or sex-seeking venues, have proven reasonably effective in promoting prevention awareness and acceptability on a small geographic scale (Hecht, Riggs, Hargraves, Wei, & Raymond, 2011), but their impact is limited to those who access these locations (Lombardo & Léger, 2007). On the other hand, online resources would be available to groups outside of a given metropolitan area and non-gay identifying men who have sex with men who may not be getting information on NPTs through location-specific means (Bowen et al., 2008). Additionally, community organizations should continue to promote NPT literacy and HIV prevention, including the identification of strategies to train and support peer educators in a more formal manner, as this appears to be an important piece in the NPT education picture.

Readers should be cautious when interpreting our findings. Having conducted a rigorous qualitative analysis, the quantification and generalizability of our results are neither possible nor intended given the use of purposive sampling of early NPT adopter gay men within the unique TasP-focused context of Vancouver. We feel that our thematic analysis approach allowed for a multi-faceted and nuanced depiction of education that would not be possible through a purely quantitative model. Our use of multiple coders and an iterative, inductive engagement with our data supports the validity of our findings (Braun & Clarke, 2006; DeCuir-Gunby, Marshall, & McCulloch, 2011). Moreover, our work satisfies Lincoln and Guba's (1985) trustworthiness criteria for evaluating qualitative research via the establishment of credibility, transferability, dependability, and confirmability. For example, we made use of inquiry audits, a technique for establishing dependability, whereby researchers external to the project examined our methods and findings to ensure accuracy in our engagement with the data. Due to the nature of our interviews, the emergent themes found here may be partially attributable to social desirability biases, as our participants may have been influenced by the public health and prevention-focused context of this study. Nonetheless, the transparency with which many participants discussed their sex lives, including high-risk incidences, and concerns about NPTs suggests that the casual, semi-structured nature of our interviews and use of peer interviewers allowed for frankness in our discussions. Indeed, the use of peer interviewers and researchers – all with previous experience in gay men's health research – helped to further establish the trustworthiness of our results by ensuring prolonged engagement, defined by Lincoln and Guba as spending sufficient time in a field to understand the sociocultural context of the phenomenon under analysis and establish rapport with participants.

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CONCLUSIONS

Overall, our work indicates that our participants learnt about NPTs through a wide variety of sources that diversely contributed to general HIV prevention knowledge and greatly varied in terms of acceptability. We found that optimal NPT education should incorporate strong, factual information with personal testimony of NPT use, and would balance quality with ease of access. Stigma remains a major barrier to NPT use and education acceptability at various levels, and may be addressed through the promotion of community support and dialogue, along with early adopter testimony, and the challenging of stigma at its structural roots of marginalization.

Health Canada's recent PrEP approval serves as a reminder that NPT implementation continues to evolve and researchers, HCPs, and community organizations all have parts to play in shaping rollout (Smith et al., 2005). HCPs should focus on integrating their response, placing the expertise of the frontline nurses, social workers, and counselors already working to promote gay men's health at the fore; public health research should pursue a community-based approach that aims to address the concerns of potential NPT users; and community organizations should continue to promote discussion of NPTs and prevention through the production of comprehensive online resources that will be available to a broader geographic audience and the diverse gay male population. Ultimately, the use and acceptability of PEP, PrEP, and TasP relies in large part on acceptable NPT education efforts; as such, it is critical that researchers and practitioners alike continue to improve, nuance, and humanize their messages as NPT rollout continues.

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Abbreviations

MSM	men who have sex with men
NPTs	new prevention technologies
PEP	post-exposure prophylaxis
PrEP	pre-exposure prophylaxis
TasP	treatment as prevention
HCP	healthcare provider

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