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HIV treatment optimism and crystal methamphetamine use and initiation among HIV-negative men who have sex with men in Vancouver, Canada: A longitudinal analysis

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ABSTRACT

Background: Treatment as Prevention (TasP) leading to increased HIV treatment optimism among men who have sex with men (MSM) has been previously associated with behavioural risk compensation, though not yet via crystal methamphetamine (CM) use. Among HIV-negative MSM in a TasP environment, this study aimed to investigate the prevalence of recent CM use over time, examine the association between HIV treatment optimism and CM use and initiation, and identify correlates of recent CM use and predictors of CM initiation.
Methods: Using data from a prospective behavioural cohort study of sexually active MSM in the Vancouver area, we used multi-level generalized mixed effect models to evaluate temporal trends in CM use, univariable and multivariable logistic regression to identify covariates of recent CM use, and univariable and multivariable survival analysis to identify predictors of CM initiation.
Results: Of 497 HIV-negative cohort participants, 10.3% reported any recent CM use at enrollment. From 2012–2016, there were no statistically significant temporal trends in overall CM use or with routes of administration. In multivariable logistic regression analyses, HIV treatment optimism was not associated with recent CM use (not retained in final model) or CM initiation (aHR = 1.06, 95% CI:0.98–1.15). Significant correlates of CM use include recent gamma-hydroxybutyrate (GHB) and ecstasy use, and having received/given drugs for sex.
Conclusions: Among HIV-negative MSM in Vancouver, HIV treatment optimism does not appear to be independently associated with CM use or initiation of use, though use of CM was both prevalent and stable over time.

1. Introduction

Treatment as Prevention (TasP) involves the use of highly active antiretroviral therapy (HAART) to treat individual HIV infections as well as to impede transmission and prevent new infections in the larger population, a novel utility demonstrated by recent research (Lima et al., 2015; Lima et al., 2010; Rodger et al., 2016; WHO, 2012). This promise of HIV treatment success has contributed to reassurance with respect to HIV among men who have sex with men (MSM), termed "HIV treatment optimism". However, while recent research has shown that increased HIV treatment optimism was not accompanied by more frequent reports of high-risk sexual behavior (HRSB) among HIV-negative MSM (Moore et al., 2017), elsewhere, this optimism has been positively associated with HRSB (Brennan et al., 2010; Chen, 2013), predominantly characterized as condomless sex (Chen, 2013). Greater HIV treatment optimism has also been associated with not having education about HIV and HIV-positive serostatus (Macapagal et al., 2017).

Crystal methamphetamine (CM), a synthetic and potent

psychostimulant, has been minimally investigated as an HRSB related to HIV treatment optimism. Prevalence of CM use has been well demonstrated to be substantially higher among MSM than the general population (Hunter et al., 2014; Lyons et al., 2013; Solomon et al., 2012). Use of CM results in heightened sexual desire and stamina, as well as lowered inhibitions (Vearrier et al., 2012). Consequently, CM has been associated with HRSB, including condomless anal intercourse and increased number of male partners, as well as more self-reported bacterial sexually transmitted infections (STIs) (Forrest et al., 2010; Hoenigl et al., 2016; Melendez-Torres et al., 2016b; Pantalone et al., 2014) and increased risk of HIV acquisition (Freeman et al., 2011; Hoenigl et al., 2016; Melendez-Torres et al., 2016b; Plankey et al., 2007; Rajasingham et al., 2012; Vosburgh et al., 2012).

We could identify no previous research that has explored CM use among MSM in an environment where TasP has been heavily promoted. Numerous other factors have been shown to be associated with CM use among MSM, including concurrent use of other substances including erectile dysfunction drugs (EDDs), gamma-hydroxybutyrate (GHB), and amyl nitrites (poppers), as well as alcohol consumption, depression, older age, HIV positive serostatus, sex in public venues, transactional sex, previous STI diagnosis, being single, and engaging in objectively HRSB (Lea et al., 2016; Lyons et al., 2013; Melendez-Torres et al., 2016a; Mimiaga et al., 2010; Ober et al., 2009; Rhodes et al., 2007). Initiation of CM use has been investigated with qualitative work among MSM, demonstrating it to have taken place predominantly in a social, non-sexual setting, with limited knowledge of the drug (Parsons et al., 2007). To our knowledge, only a single study has examined the relationship between HIV treatment optimism and CM use, and though it concluded a significant negative association, was limited to a relatively small study sample of 197 black MSM in Boston, Massachusetts, in 2008 (Mimiaga et al., 2010). No study could be identified that investigated HIV treatment optimism as a predictor or correlate of initiation of CM use among MSM or otherwise. We believe this to be a significant dearth of knowledge of real potential public health consequence.

British Columbia's Seek and Treat for Optimal Prevention of HIV/AIDS (STOP HIV/AIDS) program has embraced a TasP strategy by expanding access to HIV testing, care, and treatment (i.e., HAART) as a pilot program in Vancouver since 2010 (BCCfE, 2017a, 2017b; Heath et al., 2014; Ministry of Health, 2012). Given evidence supporting an association between TasP and HRSB (Brennan et al., 2010; Chen, 2013; Lachowsky et al., 2016b; Roth et al., 2018), and ample evidence of the association between CM use and HRSB (Rajasingham et al., 2012; Vosburgh et al., 2012), this study aimed to examine the association between HIV treatment optimism and use and initiation of CM, investigate the prevalence of recent CM use from 2012 to 2016, and identify correlates of recent CM use and predictors of CM initiation, among HIV-negative MSM in a TasP environment. We hypothesized that HIV treatment optimism would be positively associated with CM use and a predictor of initiation of CM use.

2. Methods

2.1. Study design and participants

Data were drawn from the Momentum Health Study, a bio-behavioural, longitudinal study of MSM in Vancouver, Canada. Participants were recruited through respondent-driven sampling (RDS) from February 2012 to February 2015. With RDS, the sampling process is started by purposely selecting specific participants from the community as "seeds", who then initiate chains of peer referrals. Participants were given up to 6 coupons and encouraged to recruit from members of their social and sexual networks (Lachowsky et al., 2016a). Eligibility criteria included: being 16 years or older, gender identifying as a man, reporting sex with another man in the past 6 months, currently living in Metro Vancouver, and being able to complete the questionnaire in English. Attainment of written informed consent was followed by a 90-

min computer-assisted self-interview (CASI), which collected information on sociodemographic, psychosocial, and behavioural factors. Lastly, a nurse-administered questionnaire included clinical STI/HIV screening and questions regarding history of STI and mental health diagnoses. Participants were given the option to consent to a longitudinal cohort, with study visits every 6 months up to a maximum of 4 years. Compensation consisted of a CAD 50 honorarium for each study visit and an additional CAD 10 for each subsequent participant recruited. Approval was granted by the Research Ethics Boards of The University of British Columbia, The University of Victoria, and Simon Fraser University. Data from February 2012 to February 2016 were included in this analysis.

2.2. Dependent variable

The primary outcome of this analysis was any CM use in the six-months prior to a study visit. During the CASI, participants were asked "In the PAST 6 MONTHS have you used Crystal Methamphetamine ('Crystal', 'meth')" with dichotomous "No" or "Yes" response options. Those who selected "Yes" were asked to specify the number of days they used CM in the past six-months.

The secondary outcome of this analysis was first-reported-use of CM among participants who had not previously reported CM use in the study. First-reported-use of CM was the event of interest in our survival analysis; thus a "failure" in the survival analysis was defined as the first report of CM usage for participants with no CM use reported at any previous study visit.

2.3. Independent variables

All data for explanatory variables were collected during the CASI. Demographic information included age, sexual orientation, ethnicity, and relationship status.

Psychosocial factors were measured with several scales:

2.3.1. HIV treatment optimism-skepticism scale

A 12-item scale, where higher scores indicate greater optimism (score range: 0–36; $\alpha = 0.84$). Using a 4-point Likert scale from "Strongly Disagree" to "Strongly Agree", participants provided their level of agreement with items aimed at assessing their attitudes toward HIV treatment in terms of reducing the likelihood and consequence of HIV (e.g., "If every HIV-positive person took the new treatments, the AIDS epidemic would be over." (Van de Ven et al., 2000).

2.3.2. Escape motivation scale

A 12-item scale, with greater scores indicating more escape motivations (score range: 12–48; study $\alpha = 0.90$). Using a 4-point Likert scale from "Strongly Disagree" to "Strongly Agree", participants provided their level of agreement with items aimed at assessing how much being under the influence of one or more substances might be related to sexual risk taking (e.g., "When I am high or drunk, I am more likely to do sexual things I usually wouldn't do." (McKirnan et al., 2001).

2.3.3. Gay/Bisexual self-esteem

A 7-item scale, reverse-coded, with higher scores indicating lower self-esteem (score range: 0–21; study $\alpha = 0.90$). Using a 4-point Likert scale from "Strongly Agree" to "Strongly Disagree", participants provided their level of agreement with items aimed at assessing their self-esteem as a gay/bisexual man (e.g., "I feel that I am a person of worth, at least on an equal basis with others." (Herek and Glunt, 1995).

2.3.4. Hospital anxiety and depression scale

Two 7-item subscales, with greater scores indicating more anxiety and depression symptomology (score range: 0–21 for each; study $\alpha = 0.86$ and $\alpha = 0.81$, respectively). Using various 4-point scales, participants provided responses to items aimed at assessing anxiety and