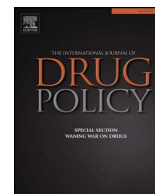




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Typology of drug use in United Kingdom men who have sex with men and associations with socio-sexual characteristics

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ABSTRACT

Background: Analysis of specific drug use patterns in men who have sex with men (MSM) is important in targeting HIV prevention and harm reduction interventions and in developing a fuller picture of drug use in context beyond consideration of use of specific drugs in isolation.

Objectives: We sought to develop a typology of recent drug use in MSM, and to explore how distribution of MSM across the classes in this typology differs by socio-sexual characteristics.

Methods: We examined last-year drug use reported by 16,814 MSM as part of a cross-sectional, internet-based survey of MSM living in the UK for which data were collected in late summer 2014. We tested models with between two and six classes for types of specific drug use, and related socio-sexual covariates to the classes in the best model using multinomial regression.

Results: Our five-class model described a range of drug use patterns, including minimal users, low-threshold users, old-skool users, chemsex-plus users and diverse users. MSM identifying as gay were more likely to not be minimal users. HIV-positive MSM were more likely to be chemsex-plus users than HIV-negative MSM. Number and type of non-steady partners, ethnicity and education were each related to class membership, though trends were complex.

Conclusions: Findings from associations between correlates and latent classes suggest avenues for service development beyond current attention to opiates or chemsex drugs. Our findings draw attention to heterogeneity in drug use patterns in MSM beyond what current discourse on chemsex drugs would suggest.

Introduction

Analyses of drug use patterns in men who have sex with men (MSM) have generally focused on examining individual drugs in isolation (Digiusto & Rawstorne, 2013; Vosburgh, Mansergh, Sullivan, & Purcell, 2012), or have examined polydrug use as a unitary variable (Boone, Cook, & Wilson, 2013; Daskalopoulou et al., 2014) without regard to types of drugs combined. This leaves aside two important points for analysis—namely, understanding how patterns of specific drug use cluster together within MSM, and how different drug use patterns are associated with socio-sexual variables.

Understanding specific drug use patterns is important in targeting HIV prevention and harm reduction interventions and in developing a fuller picture of drug use in context. For example, reports of sexualised drug use among MSM (also known as ‘chemsex’) in the UK focus on the use of three specific drugs—crystal methamphetamine, or ‘crystal

meth’; gamma-hydroxybutyric acid, or GHB; and mephedrone (McCall, Adams, Mason, & Willis, 2015), with ketamine at times included as a chemsex drug (Bourne, Reid, Hickson, Torres-Rueda, Steinberg, 2015; Bourne, Reid, Hickson, Torres-Rueda, & Weatherburn, 2015). Other latent class-based approaches to understanding typologies of substance use have drawn primarily from the US context (McCarty-Caplan, Jantz, & Swartz, 2014; Tobin, Yang, King, Latkin, & Curriero, 2016; Yu, Wall, Chiasson, & Hirshfield, 2014). Thus, whether these drugs form a coherent pattern of use, or whether they are part of broader patterns of drug use, has not yet been investigated in the UK context using quantitative data.

In this analysis, we use latent class analysis of data from a cross-sectional community-based survey of MSM living in the UK to develop a typology of recent drug use in MSM, and to explore how distribution of MSM across the classes in this typology differs by socio-sexual characteristics (including demographics, HIV testing history and sexual risk-

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related variables). Latent class analysis is a type of factor analysis. It constructs underlying and non-observed variables from observed data, specifically multicategorical latent variables, which can be used to develop underlying typologies of people. This analysis is important to understand patterns of use of specific drugs in the context of use of other drugs and to move beyond bivariate associations between use of specific drugs and other person-level characteristics.

Methods

This study used data from the 2014 Gay Men's Sex Survey. This open-access, internet-based survey recruited a community sample of MSM via general-interest gay dating websites and apps, Facebook, and the websites of community organisations in late summer 2014. While a community sample may lead to underrepresentation or overrepresentation of certain individual characteristics or risk behaviours, it is difficult to establish a probability sample of a group as diffuse in terms of behaviour and identity as MSM. It is likely that our survey may have oversampled MSM with high-risk sexual behaviour or drug use (Prah et al., 2016). The survey received ethical approval from the London School of Hygiene and Tropical Medicine ethics committee. This study included men living in the UK aged 16 or over who were sexually attracted to men.

We first constructed a latent class model with manifest indicators corresponding to the use of specific drugs in the last 12 months. The drugs we enquired about were poppers (nitrite inhalants), erectile dysfunction medications, tranquilisers, cannabis, ecstasy (MDMA), speed (amphetamine), mephedrone, GHB/GBL, ketamine, crystal methamphetamine and cocaine. We did not consider alcohol as its use was too high to be helpful in distinguishing between men, and we excluded LSD, heroin and crack as prevalence of use was too low to result in a stable model (less than 2% reported use in the last year in all cases). We tested models with between two and six latent classes, and chose the model that best balanced interpretability and fit as judged by the Bayesian information criterion, a penalised log-likelihood measure, and the scaled relative entropy, which is analogous to an R^2 for a linear regression. In scaled relative entropy, 0% indicates very poor certainty in classification and 100% indicates perfect certainty. We then inspected the conditional probabilities for each of the drugs in each class. In this case, conditional probabilities are interpreted as the predicted prevalence of last-year use of each drug for people in a specific class of drug use.

Once we had chosen an appropriate latent class model, we examined whether socio-sexual covariates were correlated with the latent classes. We examined HIV testing status, measured as HIV positive, last test HIV negative, or never received an HIV test result; sexual identity, measured as gay or another non-heterosexual identity (e.g. bisexual, queer, or 'any other term' besides straight/heterosexual); and non-steady sexual partner risk in the last year, measured as no non-steady partners, non-steady partner(s) with no unprotected anal intercourse, one non-steady partner with unprotected anal intercourse and two or more non-steady partners with unprotected anal intercourse. We also examined ethnicity (White, Black, Asian, all others) and education (high, to degree level; medium, at or above secondary school but below degree level; low, below secondary school completion). We tested these covariates in a multinomial logistic regression framework; that is, the latent classes formed a multicategorical dependent variable, and each socio-sexual covariate was tested in a separate bivariate model. We used the 'flexible model-based' method described by Lanza, Tan and Bray (2013) to account for error in classification of each observation to the different latent classes. For ease of interpretation, we transformed the multinomial logistic regression coefficients into marginal probabilities of belonging to each class for each category of the tested covariates. We did not estimate models with multiple socio-sexual correlates as these would have been uninterpretable. All analyses were undertaken in Stata v. 14 (Statacorp, College Station, TX).

Table 1
Latent class fit indices.

Number of classes	Bayesian information criterion	Scaled relative entropy (%)
2	6580	92.9
3	3596	89.9
4	3004	81.6
5	2674	79.3
6	2401	78.6

Results

The analysis sample consisted of 16,814 participants resident in the UK with data available for analysis. Of this group, 81.9% were White British and 11.3% were White non-British, 3.3% were Asian, and 1.9% were Black. An additional 1.6% identified with other ethnic groups. Participants were on average 35.1 years of age (SD 13.2). Almost half (48.5%) had a university degree. In terms of HIV status, 24.0% had never received an HIV test result, 8.8% had tested positive, and 67.2% had a last test that was negative. Furthermore, 84.4% identified as gay and 15.6% described another sexual identity. Overall, 39.7% of respondents in the analysis sample did not report use of any of the 11 drugs included in our model; 26.7% described using one drug in our model; 12.6% described using two drugs; and 21.0% described using three or more drugs.

Latent classes

We tested latent class models with between two and six latent classes. We judged that a five-class model formed the best trade-off between parsimony, complexity and model fit (see Table 1). Models with two or three classes did not show clear separation, and were thus difficult to interpret. A four-class model had comparatively worse fit, as measured by the Bayesian information criterion, compared to a five-class model. Models with six and greater classes were similarly difficult to interpret (classes were not readily distinguishable from each other, improvements in fit were marginal, and small class sizes made associations with socio-sexual covariates unstable). The five-class model had a scaled relative entropy of 79.3%, which indicates that model classification was satisfactory. Based on our inspection of the conditional probabilities for last-year drug use in each of the latent classes, we named each of the five latent classes (see Table 2).

Class 1: minimal users formed 64.2% of the respondents. One in five (20.4%) MSM in this group used poppers in the last year, whereas 11.0% used erectile dysfunction medications and 10.9% used cannabis. Conditional probabilities of all other drug use were negligible.

Class 2: low-threshold users, who formed 14.0% of the respondents, were primarily distinguished by their use of historically popular drugs that have low threshold to entry; that is, that may not be particularly stigmatised or illicit and that may be easier to access than more novel psychoactive substances. Most MSM in this group (90.3%) used poppers in the last year, while about half (47.7%) used erectile dysfunction medications. About one in five (20.4%) used cannabis. Probabilities of all other drugs were low or negligible.

Class 3: old-skool users formed a similar proportion of the respondents (14.0%) as class 2. As compared to respondents in class 2, respondents in class 3 were less likely to use poppers (though this probability was still high at 62.5%), and less likely to use erectile dysfunction medications (20.2%). However, a majority of respondents in this class reported use of several drugs which were very popular through the 1990s and the first decade of the 2000s among UK MSM (Keogh et al., 2009). For example, two-thirds each used ecstasy (61.6%) and cocaine (65.9%). This class also had notable use of more recently popular chemsex-associated drugs, specifically mephedrone (23.9%) and ketamine (18.4%); each of these drugs was more prevalent in this

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