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Research Paper

Drug use among men who have sex with men in Ireland: Prevalence and associated factors from a national online survey

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ABSTRACT

Background: Little is known about the prevalence and determinants of drug use among men who have sex with men (MSM) in Ireland. The aims of this study were to measure the prevalence of recreational drug use among MSM in a national sample, and to identify sub-groups of MSM who may benefit from targeted preventive interventions.

Methods: The MSM Internet Survey Ireland (MISI) 2015 was a community-recruited, nationally-promoted, self-completed online survey for MSM. MISI 2015 included standardised questions on recreational drugs, poppers, and drugs associated with chemsex (i.e. crystal methamphetamine, GBL/GHB, mephedrone, ketamine). Multivariable-adjusted logistic regression was used to identify factors associated with use of these substances.

Results: In the previous year, 36% of MSM used recreational drugs, 33% used poppers, and 7% used drugs associated with chemsex. Five percent were diagnosed HIV-positive. Recreational drug users were significantly younger than non-users (median = 27 vs. 32 years; $p < 0.001$); popper users were significantly older than non-users (median = 34 vs. 28 years; $p < 0.001$). The odds of recreational drug use were higher among MSM diagnosed HIV-positive (vs. never tested; AOR 2.27, 95%CI 1.39–3.70). Use of poppers, and use of drugs associated with chemsex, were also higher among MSM diagnosed HIV-positive (vs. never tested; AOR 3.77, 95%CI 2.41–5.90, and AOR 5.87, 95%CI 3.08–11.18 respectively).

Conclusions: The prevalence of recreational drug use is higher among MSM than in the general population in Ireland, and it is particularly high among MSM diagnosed HIV-positive. Targeted harm reduction messages and preventive interventions are warranted to complement population-based approaches to reducing drug use in this population.

Introduction

Significant inequalities in health and wellbeing exist between men who have sex with men (MSM) and the general population (Public Health England, 2014). Differing prevalences of substance use, including use of recreational drugs, contribute towards these inequalities. Drug-related harms are wide-ranging and, depending on the substance, may include immediate fatal poisonings, acute respiratory depression, chronic lung disease and psychosis. Drug-induced pleasure, either from a sudden "rush" or subsequent sense of euphoria, encourages repeated use and can lead to dependence. Other harms resulting from intoxication include accidents, violence and crime (Nutt, King, Saulsbury, & Blakemore, 2007).

Recreational drug use can reduce inhibitions and heighten sexual risk behaviour. Some drugs heighten sexual arousal, facilitate higher numbers of partners and are associated with increased likelihood of condomless anal intercourse (CAI) (Bourne et al., 2015; Daskalopoulou et al., 2014). MSM may use drugs to enhance sexual experiences or to increase confidence when seeking new sexual partners, and substance use may be normalised in some gay social venues (Melendez-Torres &

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Bourne, 2016). In Ireland, the number of HIV diagnoses has been increasing among MSM in recent years (HSE Health Protection Surveillance Centre, 2017). Drug use among this population may be an important contributory factor to this.

Most MSM who use recreational drugs do so on a sporadic basis, for specific purposes such as partying, socialising or having sex (Sigma Research, 2012). However, considerable harm and dependency can develop even with infrequent use. 'Poppers' are nitrite inhalants which increase blood flow to the rectal tissue, relax anal sphincter muscles, and facilitate longer sessions of anal intercourse. Although most MSM who use poppers do not experience any harm, they can cause sudden drops in blood pressure, arrhythmias, and hypoxia which may be fatal (Romanelli, Smith, Thornton, & Pomeroy, 2004). There is a growing attention on the use of drugs specifically for or during sex, so called 'chemsex'. Typically, chemsex drugs include crystal methamphetamine, gamma butyrolactone (GBL), gamma hydroxybutyrate (GHB), ketamine, mephedrone, and sometimes, cocaine. Adverse effects of drugs used in chemsex include increased risk of seizures, drug dependence, and overdose which may be fatal. Chemsex is also associated with higher-risk sexual behaviours and STI acquisition (Glynn et al., 2018; Sewell et al., 2017; Tomkins et al., 2018). In Ireland, a high prevalence of drug use has been reported in the context of chemsex among attendees at a sexual health clinic (27%) (Glynn et al., 2018), but little is known about chemsex in the wider MSM population. A small qualitative study of Irish patients who sought treatment for drug use disorders highlighted the need for public health providers to better understand the use of novel psychoactive substance use, and the health and social effects of chemsex (Joyce, MacNeela, Sarma, Ryall, & Keenan, 2018).

Little is known about the sub-groups of the MSM population who are more likely to use different recreational drugs in Ireland. There is a need for improved data on drug use among MSM given the strong influence of drug use on sexual behaviour and condom use (ECDC, 2013b) and associations with other harms. The aims of this study are to measure the prevalence of recreational drug use in a national sample of MSM in Ireland, to identify factors associated with drug use in this group, and to identify the sub-groups within the MSM population who are most likely to benefit from targeted preventive interventions.

Methods

Study design

The MSM Internet Survey Ireland (MISI) 2015 was a community-recruited, nationally-promoted, self-completed online survey for MSM, conducted over a three-month period in 2015. The survey was adapted from the UK Gay Men's Sex Survey (GMSS) 2014 and from the European MSM Internet Survey (EMIS) 2010. The survey consisted of standardised questions using specific indicators which were developed by the European Centre for Disease Prevention and Control (ECDC) for surveys of MSM. In the case of substance use, standardised questions developed for the national Healthy Ireland 2015 survey were added. The questionnaire took about 14 min to complete, and was available in English only. Respondents entered their own data directly to a purpose built online survey instrument hosted at www.demographix.com.

Participants

Men (including trans men) aged 18 years or over and living in Ireland, were invited to participate if they were attracted to other men, or had sex with men, or thought that they might have sex with men in the future.

Sampling & recruitment

A self-selected, convenience sampling strategy was used. The study population was reached through widespread promotion via LGBT community organisations, HIV and sexual health services, and through social media pages of relevant MSM community and health promotion organisations. This included sponsored adverts on Facebook and pre-scheduled tweets tagging LGBT events and groups. Banners and advertisements were used to target subscribers to gay networking apps and targeted emails were sent to Gaydar subscribers. A launch party was held on the first day of the survey and a press release was issued, resulting in national media coverage. Promotional cards were distributed at gay social and community venues, and email reminders were sent to LGBT groups and third level organisations to encourage participation.

Ethical considerations

All data collected were anonymous. Participants could withdraw from the survey at any time during completion without any data being submitted. Ethical approval was received for the study from the Research Ethics Committee of the Royal College of Physicians of Ireland.

Measurements

Independent variables

Age was analysed as a continuous variable, and as a categorical variable. Respondents were categorised as being born in Ireland, or outside of Ireland. Area of residence in Ireland was categorised as those who lived in the capital (Dublin) vs. outside Dublin.

Education level was categorised as high (degree level or higher), medium (school-leaving qualification), or low (no school-leaving qualification). Current employment status was categorised as: employed, unemployed, students, or other (retired/sick leave/other).

Participants were asked to describe their sexual identity. They were categorised as gay/homosexual, bisexual, and other (i.e. use another or no term to identify). Men were also asked about their "outness", i.e. the proportion of people who knew them who were aware of their attraction to men, and categorised accordingly (out to all or almost all, more than half, less than half, few, or none). HIV testing history was self-reported and categorised as diagnosed HIV positive, last test HIV negative, or never tested for HIV. MISI 2015 did not gather detailed information relating to biomedical preventive strategies for HIV, such as treatment as prevention and pre-exposure prophylaxis (PrEP), since PrEP was not routinely available in Ireland at the time.

Participants were asked how many standard drinks they would consume on a typical drinking occasion in the last 12 months. One standard drink was described as a half glass of stout/lager/cider, a small glass of wine, or a pub measure of spirit. A dichotomous variable for habitual binge drinking (i.e. 6 or more standard drinks consumed in a typical drinking session) was generated. A dichotomous variable for current smoking (yes/no) was also generated.

Dependent variables

Participants were asked about their use of any of the following drugs in the past year: amphetamine, cannabis, cocaine, crack cocaine, crystal methamphetamine, ecstasy, heroin or related drugs, mephedrone, GBL/GHB, ketamine, LSD, poppers. Men were also asked if they had ever injected any drug other than anabolic steroids or medicines or if they had ever been injected by someone else.

There is no universal agreement on how psychotropic substances should be classified. For the purposes of this study, poppers were considered as a distinct group of drugs because of their high prevalence in previous surveys of MSM, and because the legality of their use has been less clear than for other substances in Ireland (Gay Health Network, 2009; Sigma Research, 2009). Thus, the following dichotomous outcome variables were used: (1) any recreational drug use (excluding poppers), (2) popper use, and (3) drugs associated with chemsex (i.e. crystal methamphetamine, GBL/GHB, ketamine, mephedrone).

Cannabis is the most widely used illicit drug in Ireland (National Advisory Committee on Drugs and Alcohol, 2016), and its use could potentially dominate or mask other patterns of overall recreational drug use. A sensitivity analysis was thus undertaken where recreational drug use (excluding poppers) was further categorised into (1) cannabis use and (2) other recreational drug use (excluding cannabis). The factors independently associated with cannabis use were identified and compared with the factors associated with other recreational drug use.

Statistical analysis

The data were analysed using IBM SPSS Statistics 22.0 (IBM Corp, Armonk, NY, USA). When statistical tests were applied, p values of < 0.05 were taken to be statistically significant.

The characteristics of survey respondents were first assessed using descriptive statistics, and bivariate associations between categorical variables were examined using chi-squared tests and Fisher's exact test. As age was not normally distributed, comparison of median age across independent groups was examined using Mann–Whitney *U* tests. Single-predictor logistic regression was used to calculate crude measures of association (odds ratios (OR)) between independent variables and dichotomous outcomes. Independent variables were then entered in multi-predictor models if $p < 0.2$ on crude analysis. Adjusted measures of association (adjusted odds ratios (AOR)) were determined using multi-predictor logistic regression models with forward stepwise selection. The best fit models were chosen based on Hosmer-Lemeshow Goodness of Fit values (> 0.05) and Nagelkerke's R^2. Multi-predictor models were not run for injecting drug use because of small numbers of participants in this group.

Potential effect modification by age group and HIV testing history was considered a priori. Associations between exposure variables and outcome variables (i.e. any recreational drug use, poppers use, chemsex drug use) were examined for effect modification by age group and HIV testing history. No significant interactions were observed, and the results are not reported here.

The possibility of multicollinearity between independent variables was tested. In the correlation matrices of predictor variables, all pairwise Pearson correlation coefficients were < 0.4 suggesting that multicollinearity was not an issue.

Results

The final sample consisted of 3090 participants. Their characteristics are shown in Table 1. The median age of all respondents was 30 years (range 18–80 years).

Overall recreational drug use

Thirty-six percent of all respondents had used recreational drugs in the last year (excluding poppers). Men who used drugs in the last year were significantly younger (median 27 years) than those who did not (median 32 years; $Z = 11.01$, $p < 0.001$). The most frequently used drugs were cannabis (28%), ecstasy (17%) and cocaine (13%). Table 2 shows the associations between individual drug use, age group and HIV test history. Men aged under 25 years had significantly higher prevalence of use of cannabis, ecstasy, amphetamine and LSD compared to older men. Men aged over 40 years were significantly more likely to have ever injected drugs.

The prevalence of any drug use in the last year (excluding poppers) was significantly higher in men with diagnosed HIV (53%) compared with those whose last HIV test was negative (36%) and men who never tested (34%) ($\chi^2 = 21.2$; $p < 0.001$).

The factors associated with any recreational drug use (excluding poppers) in the last year are shown in Table 3. In the adjusted model, the odds of recreational drug use were significantly higher among students, men who lived in Dublin, and men who smoked tobacco and/or typically binge drink. Any drug use increased with increasing openness about homosexual desire (i.e. outness). The odds of recreational drug use were higher among men diagnosed HIV-positive (AOR 2.27, 95%CI 1.39–3.70), followed by men whose last test was negative (AOR 1.37, 95%CI 1.09–1.72) compared with those who never tested.

A sensitivity analysis explored the influence of cannabis on overall associations with recreational drug use. The only differences of note related to HIV test history and student status. The odds of cannabis use were not significantly different for HIV test history (diagnosed HIV positive vs. those who never tested; AOR 1.14, 95%CI 0.68–1.94). The association between recreational drug use and living with diagnosed HIV was strengthened after excluding cannabis (vs. those who never tested; AOR 3.38, 95%CI 2.04–5.61). Cannabis use was significantly associated with being a student (vs. employed; AOR 1.84, 95%CI 1.42–2.39); no association was observed for other recreational drug use after excluding cannabis (vs. employed; AOR 1.17, 95%CI 0.88–1.56).

Table 1
Characteristics of study participants, MSM Internet Survey Ireland 2015 (N = 3090).

		n	% of N
Age group (years)	< 25	965	31.2
	25–39	1276	41.3
	40 +	849	27.5
Education level	Low/Medium	1379	45.9
	High	1626	54.1
Employment	Employed	1992	65.9
	Unemployed	205	6.8
	Student	693	22.9
	Other	134	4.4
Area of residence	Dublin	1396	48.6
	Outside Dublin	1479	51.4
Country of birth	Ireland	2639	86.0
	Outside Ireland	430	14.0
Sexual identity	Gay/homosexual	2411	79.1
	Bisexual	406	13.3
	Other	230	7.6
Outness	All or almost all	1531	51.0
	More than half	449	15.0
	Less than half	274	9.1
	Few	482	16.1
	None	267	8.9
HIV testing history	Diagnosed HIV +ve	152	5.0
	Last test HIV -ve	1789	58.4
	Never tested	1123	36.7
Binge drinking	Yes	1563	58.0
	No	1132	42.0
Current smoking	Yes	1085	35.4
	No	1980	64.6

Poppers

One third of respondents indicated that they had used poppers in the last year. Men who had used poppers in the last year were significantly older (median 34 years) than those who did not (median 28 years; $Z = 11.16$, $p < 0.001$). Use was highest among men aged 40–49 years (45%). It was significantly higher among men diagnosed HIV-positive (68%) compared with men whose last test was negative (39%) and men who never tested (19%) ($\chi^2 = 208.1$; $p < 0.001$).

Factors associated with use of poppers in the last year are shown in Table 4. In the adjusted model, the odds of popper use were significantly higher among older men, men living in Dublin, those who typically binge drink, those who used other recreational drugs, and men who had tested for HIV. Compared with men who had never tested for HIV, the odds were highest among men diagnosed HIV-positive (AOR 3.77, 95%CI 2.41–5.90), followed by those whose last test was negative (AOR 2.00, 95%CI 1.59–2.51).

Table 2
Prevalence of use of recreational drugs in the last year by age group and HIV status of participants, MSM Internet Survey Ireland 2015.

			Age Group (years)				HIV testing history			
	N	%	< 25 (%)	25–39 (%)	40+ (%)		Diagnosed Positive (%)	Last test negative (%)	Never HIV tested (%)	
Any drug (other than poppers)	1,113	36.0	47.7	35.6	23.4	***	53.0	36.0	34.0	***
Cannabis	872	28.2	43.0	25.5	15.6	***	30.9	27.4	29.6	ns
Ecstasy	510	16.5	23.0	17.2	8.1	***	28.3	17.6	13.6	***
Cocaine	404	13.1	13.1	16.2	8.4	***	33.6	13.6	9.8	***
Amphetamine	143	4.6	5.9	5.3	2.2	***	9.9	4.5	4.2	**
Ketamine	141	4.6	5.3	5.6	2.1	***	13.8	5.1	2.7	***
GBL/GHB	106	3.4	1.5	4.8	3.7	***	17.8	3.8	0.9	***
LSD	81	2.6	5.0	2.0	0.8	***	4.0	2.6	2.6	ns
Mephedrone	64	2.1	1.9	2.7	1.4	ns	11.2	2.0	0.9	***
Crystal meth.	43	1.4	0.6	1.9	1.5	*	13.8	0.8	0.6	***
Crack cocaine	13	0.4	0.4	0.2	0.7	ns	4.0	0.2	0.3	***
Heroin	6	0.2	0.4	0.1	0.1	ns	2.0	0.0	0.2	**
Poppers	991	32.9	19.8	36.0	43.2	***	67.8	38.6	18.6	***
Chemsex drugs	221	7.2	6.5	8.7	5.5	ns	25.0	7.9	3.7	***
Injection drug use (lifetime)	50	1.6	0.9	1.5	2.6	*	14.9	1.2	0.6	***

ns non-significant. Fisher's exact test used where cell counts < 5.
* χ^2: $p < 0.05$.
** χ^2: $p < 0.01$.
*** χ^2: $p < 0.001$.

Drugs associated with chemsex

Seven percent of respondents used one or more of the four drugs associated with chemsex in the last 12 months. The use of chemsex drugs was most prevalent among those aged 25–29 years (9%) but there was no significant difference in the median age of those who used these drugs and those who did not. Use of chemsex drugs in the last year was significantly higher among men diagnosed HIV-positive (25%) compared with men whose last test was HIV-negative (8%) and men who never tested (4%) ($\chi^2 = 94.7$; $p < 0.001$).

Factors associated with chemsex drug use are shown in Table 5. In the adjusted model, the odds of using drugs associated with chemsex were significantly higher among men who lived in Dublin, smokers, men who used poppers, and men who had tested for HIV previously, particularly those diagnosed HIV-positive (AOR 5.87, 95%CI 3.08–11.18).

Injecting drug use

Two percent of all respondents had ever injected drugs in their

Table 3
Demographic, lifestyle and other factors associated with any recreational drug use (other than poppers) in the last year, MSM Internet Survey Ireland 2015 (N = 1113).

		Crude OR	95% CI	Adj. OR	95% CI
Age (per year)		0.96	(0.96, 0.97)	0.96	(0.95, 0.97)
Education level	Low/Medium	1.0			
	High	0.91	(0.79, 1.06)		
Employment	Employed	1.0		1.0	
	Unemployed	1.33	(0.99, 1.79)	1.09	(0.74, 1.61)
	Student	1.63	(1.37, 1.95)	1.52	(1.19, 1.95)
	Other	0.63	(0.42, 0.94)	1.35	(0.75, 2.44)
Area of residence	Outside Dublin	1.0		1.0	
	Dublin	1.39	(1.19, 1.62)	1.36	(1.12, 1.65)
Country of birth	Outside Ireland	1.0			
	Ireland	0.96	(0.78, 1.19)		
Sexual identity	Gay	1.0			
	Bisexual	0.86	(0.69, 1.07)		
	Other	1.35	(1.02, 1.77)		
Outness	All or almost all	1.0		1.0	
	More than half	0.73	(0.59, 0.91)	0.76	(0.58, 0.99)
	Less than half	0.59	(0.45, 0.78)	0.58	(0.42, 0.81)
	Few	0.48	(0.38, 0.60)	0.56	(0.42, 0.75)
	None	0.39	(0.29, 0.53)	0.62	(0.42, 0.90)
HIV testing history	Never tested	1.0		1.0	
	Last test -ve	1.09	(0.93, 1.27)	1.37	(1.09, 1.72)
	Diagnosed HIV + ve	2.20	(1.56, 3.09)	2.27	(1.39, 3.70)
Binge drinking	No	1.0		1.0	
	Yes	1.94	(1.65, 2.28)	1.33	(1.09, 1.61)
Current smoker	No	1.0		1.0	
	Yes	4.34	(3.71, 5.09)	4.12	(3.39, 4.99)
Popper use last year	No	1.0		1.0	
	Yes	2.27	(1.94, 2.66)	2.57	(2.09, 3.16)

Single-predictor logistic regression was undertaken for each of independent variables separately. If $p < 0.2$ on crude analysis, the independent variable was included in the multi-predictor model with forward stepwise selection. Adjusted odds ratios are presented for the independent variables selected by the multi-predictor model with best fit.

Table 4
Demographic, lifestyle and other factors associated with use of poppers in the last year, MSM Internet Survey Ireland 2015 (n = 991).

		Crude OR	95% CI	Adj. OR	95% CI
Age (per year)		1.03	(1.02, 1.04)	1.04	(1.02, 1.05)
Education level	Low/Medium	1.0			
	High	1.36	(1.16, 1.59)		
Employment	Employed	1.0		1.0	
	Unemployed	0.85	(0.62, 1.15)	1.16	(0.79, 1.71)
	Student	0.40	(0.33, 0.50)	0.62	(0.47, 0.81)
	Other	0.69	(0.47, 1.03)	0.60	(0.35, 1.02)
Area of residence	Outside Dublin	1.0		1.0	
	Dublin	1.77	(1.51, 2.08)	1.58	(1.31, 1.92)
Country of birth	Outside Ireland	1.0			
	Ireland	0.99	(0.80, 1.23)		
Sexual identity	Gay	1.0		1.0	
	Bisexual	0.57	(0.45, 0.73)	0.65	(0.48, 0.89)
	Other	0.52	(0.37, 0.72)	0.62	(0.42, 0.93)
Outness	All or almost all	1.0			
	More than half	0.92	(0.73, 1.15)		
	Less than half	0.80	(0.61, 1.06)		
	Few	0.73	(0.58, 0.91)		
	None	0.52	(0.38, 0.71)		
HIV testing history	Never tested	1.0		1.0	
	Last test HIV –ve	2.75	(2.30, 3.29)	2.00	(1.59, 2.51)
	Diagnosed HIV + ve	9.22	(6.31, 13.48)	3.77	(2.41, 5.90)
Binge drinking	No	1.0		1.0	
	Yes	1.26	(1.07, 1.49)	1.51	(1.23, 1.84)
Current smoker	No	1.0			
	Yes	1.52	(1.30, 1.78)		
Other recreational drug use last year	No	1.0		1.0	
	Yes	2.27	(1.94, 2.66)	2.70	(2.20, 3.30)

Single-predictor logistic regression was undertaken for each of independent variables separately. If $p < 0.2$ on crude analysis, the independent variable was included in the multi-predictor model with forward stepwise selection. Adjusted odds ratios are presented for the independent variables selected by the multi-predictor model with best fit.

Table 5
Demographic, lifestyle and other factors associated with use of one or more of GHB/GBL, crystal methamphetamine, mephedrone and ketamine in the last year, MSM Internet Survey Ireland 2015 (n = 221).

		Crude OR	95% CI	Adj. OR	95% CI
Age (per year)		0.99	(0.98, 1.00)	0.97	(0.95, 0.99)
Education level	Low/Medium	1.0			
	High	1.40	(1.06, 1.86)		
Employment	Employed	1.0			
	Unemployed	1.11	(0.66, 1.87)		
	Student	0.79	(0.56, 1.13)		
	Other	0.78	(0.37, 1.62)		
Area of residence	Outside Dublin	1.0		1.0	
	Dublin	2.17	(1.60, 2.93)	1.67	(1.17, 2.38)
Country of birth	Outside Ireland	1.0			
	Ireland	0.77	(0.53, 1.11)		
Sexual identity	Gay	1.0			
	Bisexual	0.62	(0.38, 1.00)		
	Other	1.33	(0.83, 2.11)		
Outness	All or almost all	1.0			
	More than half	0.60	(0.39, 0.92)		
	Less than half	0.64	(0.38, 1.08)		
	Few	0.55	(0.36, 0.85)		
	None	0.04	(0.01, 0.26)		
HIV testing history	Never tested	1.0		1.0	
	Last test HIV -ve	2.26	(1.58, 3.22)	2.04	(1.29, 3.23)
	Diagnosed HIV +ve	8.80	(5.43, 14.24)	5.87	(3.08, 11.18)
Binge drinking	No	1.0			
	Yes	1.50	(1.11, 2.04)		
Current smoker	No	1.0		1.0	
	Yes	2.56	(1.94, 3.38)	2.55	(1.81, 3.59)
Popper use last year	No	1.0		1.0	
	Yes	5.98	(4.39, 8.14)	4.92	(3.39, 7.14)

Single-predictor logistic regression was undertaken for each of independent variables separately. If $p < 0.2$ on crude analysis, the independent variable was included in the multi-predictor model with forward stepwise selection. Adjusted odds ratios are presented for the independent variables selected by the multi-predictor model with best fit.

lifetime. Those who had injected drugs were significantly older (median 37 years) than those who had never injected drugs (median 30 years; Z = 2.51, p = 0.012). The prevalence of previous drug injection was significantly higher among men diagnosed HIV-positive (15%) compared with those whose last test was HIV-negative (1%) and men who had never tested (0.6%) (χ^2 = 168.8; p < 0.001).

Discussion

MSM have high prevalence of recreational drug use (36%) compared with the general adult population in Ireland, and by European standards. The most recent National Drug Prevalence Survey in Ireland reported that 13% of men in the general population had used drugs or poppers in the last year (National Advisory Committee on Drugs and Alcohol, 2016). Lifetime drug use is also high among Irish adults relative to other European countries (European Monitoring Centre for Drugs and Drug Addiction, 2015).

The increased odds of recreational drug use among younger men, and among those living in a larger urban area (Dublin), were consistent with previous studies (Bonell, Hickson, Weatherburn, & Reid, 2010; Holt, Mao, Prestage, Zablotska, & de Wit, 2011; Thiede et al., 2003). The higher prevalence of drug use among men living with diagnosed HIV is consistent with a large cross-sectional study of seropositive MSM in the United Kingdom (UK) (Daskalopoulou et al., 2014). The reasons for this high prevalence are poorly understood. Recreational drug use among MSM may be associated with serodiscordant CAI (Daskalopoulou et al., 2014), which can facilitate onward transmission of HIV. However, it is also plausible that drug-using MSM are more informed of their need to test regularly for HIV, and may thus be more likely to have a HIV-positive diagnosis as a result. Recreational drug use is of particular concern among HIV-positive MSM on treatment, given its association with decreased adherence to anti-retroviral therapy (ART); this may lead to higher viral load and poorer treatment outcomes for seropositive men (Colfax & Guzman, 2006; Daskalopoulou et al., 2014; Hinkin et al., 2007; Marquez, Mitchell, Hare, John, & Klausner, 2009). Drug interactions may arise between recreational drugs and ART, resulting in adverse outcomes among drug-using HIV-positive MSM (Bracchi et al., 2015; Colfax & Guzman, 2006; Daskalopoulou et al., 2014). This subgroup of MSM may thus benefit from focused drug prevention and harm reduction interventions.

Although one third of MSM had used poppers in the last year, the prevalence was lower than in previous surveys of MSM in Ireland (43% in 2006–08) (Gay Health Network, 2009; Sigma Research, 2009). The socio-demographic factors associated with use of poppers differed from the factors associated with use of other recreational drugs. Elevated use among men in their forties and among men with diagnosed HIV has also been observed in the UK (Sigma Research, 2011).

The high prevalence of popper use among men diagnosed HIV-positive (68%) is of concern. Men who use poppers may be more aware of their need to test regularly for HIV, and this may contribute to the higher prevalence in this group. However, men who use poppers have also reported reduced sense of control during sex (ECDC, 2013a), and the risk of seroconversion is increased among HIV-negative receptive CAI partners when poppers are used during sex (Buchbinder et al., 2005; Macdonald et al., 2008). It is uncertain whether popper users are more likely to engage in serodiscordant CAI, but it is plausible in the context of a reduced sense of control and a possible tendency towards higher risk sexual behaviours.

The prevalence of use of chemsex drugs was lower (7%) than in studies of MSM attending sexual health clinics in Dublin (18–27%) (Glynn et al., 2018) and London (17%) (Hegazi et al., 2017). However, MISI 2015 is likely to have recruited a more diverse sample than are recruited in clinical settings. An online survey of 2328 MSM across Ireland, Northern Ireland, Scotland and Wales reported that 8% of respondents had used chemsex drugs in the last year (Frankis, Flowers, McDaid, & Bourne, 2018). This aligns closely with our findings, and suggests that they are more likely to be generalisable to the wider MSM population in Ireland.

Use of chemsex drugs was highest among men aged 25–39 years, and among men living in Dublin. Chemsex may be facilitated through increased use of geo-social networking apps, and in urban centres, apps have been reported to facilitate large gatherings of MSM at short notice (Bourne et al., 2015). This may partially explain the higher odds of use of these drugs in the capital city.

The odds of use of chemsex drugs were higher among men diagnosed HIV-positive, and this was consistent with previous studies (Frankis et al. 2018; Melendez-Torres et al., 2018). The likelihood of HIV/STI transmission may be increased by CAI in the context of chemsex, as well as sharing of needles when injecting drugs. Research from the UK suggests that those who use drugs for chemsex are more likely to engage in HIV serodiscordant CAI (Hegazi et al., 2017). Among HIV-seronegative MSM who attend sexual health clinics, those who used chemsex drugs had more CAI partners and more serodiscordant CAI than those who didn't use these drugs (Sewell et al., 2017). MSM who engaged in chemsex have also reported more high-risk behaviours such as group sex and fisting, and they had higher odds of using post-exposure prophylaxis (PEP) for HIV (Hegazi et al., 2017).

Importantly, men often underestimate the intricate dosing differences for chemsex drugs which can affect their level of risk (Bourne et al., 2015); one extra millilitre of GBL beyond a moderate dose can result in overdose, unconsciousness, coma and death (Sigma Research, 2012). As GBL is a street drug, the amount of drug in one millilitre may vary. In London, MSM who had used these drugs had a poor understanding of dosing when interviewed (Bourne et al., 2015). In Dublin, 23% of MSM who engaged in chemsex reported that they or their partner had lost consciousness as a consequence of drug use (Glynn et al., 2018). To date, the findings from MISI 2015 have been used to inform prevention and harm reduction messages around chemsex in the MSM community in Ireland, particularly in Dublin. Our results suggest that targeted messages among MSM living with HIV may be of additional benefit.

The high levels of tobacco smoking and binge drinking in this survey suggest these legal substances have a considerable public health impact on MSM in Ireland. Half of tobacco smokers will have their lives shortened by it, with life-time smokers losing on average 10 years of life (Doll, Peto, Boreham, & Sutherland, 2004). Men with diagnosed HIV who smoke will lose more life years to smoking than they will to HIV (Helleberg et al., 2015). Clustering of risk behaviour was observed with regard to overall substance use in this study. Respondents who used drugs in the last year were significantly more likely to binge drink on a typical drinking occasion, to smoke tobacco, and to use poppers. This suggests that integrated prevention interventions are warranted across the spectrum of drug, alcohol and tobacco use as a means of addressing risk behaviours which often cluster together in the MSM population.

MSM who were students had a different culture of drug use from other MSM. They were more likely to use recreational drugs, specifically cannabis, and less likely to use poppers. Previous studies in Ireland have shown high levels of experimentation with recreational drugs among students in the general population (Barrett & Bradley, 2016; Bingham, O'Driscoll, & De Barra, 2016). Thus, this subgroup of MSM may benefit from drug prevention interventions at the population level, as well as targeted messages for LGBT students.

MISI 2015 was the largest survey of MSM ever conducted in Ireland. The large sample size increased statistical power to detect true associations between individuals' characteristics and the use of different substances. The anonymous, online nature of the survey may have increased the validity of responses, particularly with regard to HIV testing history and substance use behaviours. Previous validity studies indicate that there is generally higher reporting of substance use in online surveys of MSM compared to other types of surveys (Link & Mokdad, 2005; Perlis, Des Jarlais, Friedman, Arasteh, & Turner, 2004). MISI 2015 was widely promoted among the MSM community and is thus likely to have

wider reach and increased generalisability.

The cross-sectional design of this study offered no information about causality, and future prospective research may help to elucidate a temporal sequence for observed associations. The survey was only available in the English language, and this may have resulted in selection bias. Fourteen percent of participants were born outside of Ireland, but this may be an underestimate of the true proportion of non-native MSM living in Ireland. Latin American MSM account for a disproportionate number of new diagnoses of HIV in Ireland (HSE Health Protection Surveillance Centre, 2017), and they represent an important subgroup for prevention interventions.

Older MSM and those living in remote areas may have been underrepresented due to the online nature of the survey. MSM who lacked internet at home or on their phone may not have been able to participate. Convenience sampling typically recruits younger and better educated MSM than those recruited through probability sampling (Prah et al., 2016). However, our sampling strategy allowed for a larger sample size to be achieved, and random sampling in the MSM population is particularly challenging given the absence of a sampling frame.

All data were self-reported and no objective measurements were taken. The prevalence of drug use in the context of chemsex may have been overestimated or underestimated. The survey did not specifically ask if substances were used in the context of sexual encounters. Some men may have used these drugs outside of sexual settings, in which case the assumed prevalence of their use in chemsex would be overestimated. However, the definition of chemsex is not fixed, and it may also include more common stimulants such as cocaine, in which case the overall use would be underestimated in this study. Furthermore, MISI 2015 did not collect data in relation to motivations for drug use, mental health measures, dependence scales, or drug overdose. Future surveys of MSM in Ireland should include specific questions on these measures to identify reasons for drug use, and prevalence of adverse outcomes.

When the MISI 2015 survey was planned, the perspective on HIV preventive interventions such as PrEP and undetectable = untransmittable (U = U) messaging was less developed than at the present time. We acknowledge that the concept of serodiscordant CAI may also differ in the context of these interventions.

Although MSM in Ireland are likely to benefit from population-based approaches to reduce substance use, targeted interventions for this community are warranted. These need to be planned with community partners who have in-depth knowledge of the sub-groups within this population, particularly those with a diagnosis of HIV. They may include peer outreach activities; harm reduction campaigns promoted through social media and geo-social networking apps; enhanced community-based information and support services; and brief intervention training for healthcare professionals and who work regularly with the MSM community.

Conclusions

Recreational drug use is common among MSM in Ireland, and the prevalence is highest among men living with diagnosed HIV. Younger men and those living in urban centres have higher prevalence of use of most drugs. Harm reduction messages and preventive interventions should be tailored and targeted to benefit MSM, and should recognise the clustering of risk behaviours across substances. Enhanced information and support services, and peer outreach activities, will help to reduce this burden.

Declaration of interest

None.

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