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ORIGINAL RESEARCH

Sexualized drug use ('chemsex') and high-risk sexual behaviours in HIV-positive men who have sex with men

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Objectives

The incidence of sexually transmitted infections (STIs) and HIV infection remains high in gay, bisexual, and other men who have sex with men (MSM) in the UK, and sexualized drug use ("chemsex") and injecting drug use ("slamsex") may play a part in this. We aimed to characterize HIV-positive MSM engaging in chemsex/slamsex and to assess the associations with self-reported STI diagnoses and sexual behaviours.

Methods

Data from a 2014 survey of people attending HIV clinics in England and Wales were linked to clinical data from national HIV surveillance records and weighted to be nationally representative. Multivariable logistic regression assessed the associations of chemsex and slamsex with self-reported unprotected anal intercourse (UAI), serodiscordant UAI (sdUAI) (i.e. UAI with an HIV-negative or unknown HIV status partner), sdUAI with a detectable viral load (>50 HIV-1 RNA copies/mL), hepatitis C, and bacterial STIs.

Results

In the previous year, 29.5% of 392 sexually active participants engaged in chemsex, and 10.1% in slamsex. Chemsex was significantly associated with increased odds of UAI [adjusted odds ratio (AOR) 5.73; $P < 0.001$], sdUAI (AOR 2.34; $P < 0.05$), sdUAI with a detectable viral load (AOR 3.86; $P < 0.01$), hepatitis C (AOR 6.58; $P < 0.01$), and bacterial STI diagnosis (AOR 2.65; $P < 0.01$). Slamsex was associated with increased odds of UAI (AOR 6.11; $P < 0.05$), hepatitis C (AOR 9.39; $P < 0.001$), and bacterial STI diagnosis (AOR 6.11; $P < 0.001$).

Conclusions

Three in ten sexually active HIV-positive MSM engaged in chemsex in the past year, which was positively associated with self-reported depression/anxiety, smoking, nonsexual drug use, risky sexual behaviours, STIs, and hepatitis C. Chemsex may therefore play a role in the ongoing HIV and STI epidemics in the UK.

Keywords: hepatitis C, HIV transmission, men who have sex with men, recreational drugs, sexually transmitted infections

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Introduction

In 2015, there were over 435 000 new diagnoses of sexually transmitted infections (STIs) in England, and gay, bisexual and other men who have sex with men (MSM) were one of the most heavily impacted groups [1]. From 2012 to 2015, STI diagnoses in MSM rose sharply, with gonorrhoea increasing by 105%, syphilis by 95%, and chlamydia by 52% [1]. Sexually transmitted enteric infections in MSM have also increased, with diagnoses of

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†See Appendix.

non-travel-associated *Shigella flexneri 2a* among men increasing by 30% from 2014 to 2015, while diagnoses in women remained stable [2]. Furthermore, new HIV diagnoses in MSM rose to 3360 in 2014 [3], and modelling studies suggest that HIV incidence among MSM is increasing in the UK [4]. Sexual transmission of hepatitis C virus (HCV) is also ongoing in HIV-positive MSM [5]. Several factors are likely to have contributed to the rise in infections in MSM, one of which may be sexualized drug use.

Sexualised drug use, often called 'chemsex' or 'party and play', is the practice of intentionally using drugs before or during sex to increase both sexual pleasure and arousal, and is practised mainly by gay, bisexual and other MSM [6–8]. In the UK, the most common chemsex drugs are crystal methamphetamine, gamma-hydroxybutyric acid/gamma-butyrolactone (GHB/GBL), and mephedrone (MCAT), with ketamine also used to facilitate sex [7]. As a consequence of the prolonged nature of chemsex sessions, which often involve mucosally traumatic and condomless sex, there is an increased risk of transmission of HIV, HCV and other STIs [9–12]. Chemsex drugs can also be injected, in a behaviour called 'slamming', or 'slamsex', although this practice is rare with GHB/GBL. Slamsex brings with it additional risks of HIV and HCV infection if needles or other injecting equipment is shared.

Previous work in the UK has shown that, among HIV-positive MSM, recreational drug use, regardless of the sexual context, is associated with condomless sex, including with partners of unknown or HIV-negative status, creating the possibility for HIV transmission [13,14]. Drug use has also been linked to outbreaks of *Shigella flexneri 3a* among MSM in London [15] and an increased incidence of bacterial STIs and hepatitis C [12,16–18]. Reports from urban centres such as London and Bristol suggest that chemsex is increasing in popularity [6,8,19,20], is more common among HIV-positive than HIV-negative MSM [7,8,13,16], and may be linked to HIV transmission [9,13,21–23].

Despite these concerns, quantitative data on chemsex and its associated risks are sparse [8,13]. Indeed, a recent editorial in the *British Medical Journal* called for chemsex to become a national public health priority in view of the risk of HIV and STI transmission, while highlighting the fact that a lack of quantitative data on chemsex and slamsex is limiting the efforts of clinicians and policy makers [24]. To address this gap, we aimed to quantify the national prevalence of chemsex and slamsex among HIV-positive MSM in the UK, characterize the populations involved, and explore associations with sexual risk behaviours, hepatitis C, and bacterial STI diagnoses.

Methods

Study design and data collection

Positive Voices is a cross-sectional survey of people living with HIV in the UK. Full details of the study and recruitment methods have been presented previously [25]. Briefly, adults (aged ≥18 years) attending one of 30 National Health Service (NHS) HIV clinics in England and Wales were selected to participate, using the national cohort of persons diagnosed with HIV infection receiving care held at Public Health England (PHE) as a national sampling frame. Data were collected anonymously using a web-based computer-assisted self-interview from May to November 2014.

Data processing

Using an anonymous individual identifier, survey responses were linked to clinical and demographic records in the national cohort of persons in HIV care [26]. Linking the two databases allowed us to incorporate clinical data on participant viral loads at clinic visits in the last year into our study. Of the 392 sexually active MSM, clinical data on viral loads were available for 361 (92.1%).

Survey data were weighted by standardization based on the age and risk group distributions in the 2014 clinical data set of the national cohort of persons in HIV care [26]. In this way, the data presented here were made to be representative of the entire population of people with HIV infection accessing care in the UK. Sampling weights were subsequently applied to account for the unequal sampling probability at different participating clinics.

Assessment of drug use for sexual pleasure

Participants were asked to report on the use of crystal methamphetamine, GHB/GBL, ketamine, and mephedrone before or during sexual encounters in the past year. The slang/street names for all drugs were included in the questionnaire. Chemsex was defined as the use of one or more of these drugs in a sexual context using any route. Participants who specifically reported injecting any of the chemsex drugs for sexual purposes were classified as having engaged in slamsex and were considered as a subset of chemsex users. Comparators were sexually active MSM who did not engage in the behaviour.

Sexual behaviours and STIs

Self-reported data were collected on condom use, number of sexual partners, partner type (regular or casual), and

HIV status of sexual partners over the previous year. Unprotected anal intercourse (UAI) was defined as anal sex without a condom with any partner in the previous year. Serodiscordant UAI (sdUAI) was defined as having UAI with a partner of unknown or HIV-negative status. Participants were deemed to have engaged in sdUAI with a detectable viral load if in the previous year they had had sdUAI and had at least one viral load recorded >50 HIV-1 RNA copies/mL. The categories of sexual behaviour were not mutually exclusive and comparators were sexually active MSM who did not engage in the behaviour.

We defined participants as having been diagnosed with an STI in the previous year if they reported a new diagnosis of chlamydia, gonorrhoea or syphilis in the previous year. If a person was diagnosed with two or more STIs in the previous year then he was classed as having had multiple STIs. Participants also reported whether they had ever been diagnosed with hepatitis C.

Assessment of other variables

Information on age, country of birth, educational attainment, employment status, housing status, religion, relationship status, diagnosed depression/anxiety, smoking status, frequency of binge drinking (consuming six or more units of alcohol if female and eight or more if male in one session), illicit drug use, antiretroviral therapy (ART) status, and year of HIV diagnosis was self-reported in the survey. Categorical variables were created: age was categorized as 18–34, 35–44, 45–54, and ≥55 years; region of birth (UK, rest of Europe, Africa and other) was created based on country of birth; nonsexual recreational drug use was assessed by asking participants to indicate from a list which recreational drugs they had taken in the last year, coding participants who indicated having taken one or more of the drugs as drug users, but excluding participants who reported only taking drugs before or during sex; time since HIV diagnosis was calculated as the difference between self-reported year of diagnosis and the year of survey completion (2014 for all participants), and categorized as <2 years since diagnosis, 2–5 years since diagnosis, 6–10 years since diagnosis, and ≥11 years since diagnosis.

Statistical analyses

All analyses and data cleaning were conducted in STATA/MP 14.1 (StataCorp MP College Station, Texas, USA) and missing data were assumed to be missing at random. The weighted prevalence of chemsex and slamsex in sexually active MSM was calculated overall, and for each chemsex drug, with 95% confidence intervals (CIs). We tested if chemsex and slamsex use differed by various sociodemographic factors and health indicators using a two-tailed χ^2 statistic, and considered differences to be statistically significant at $P < 0.05$.

We assessed the associations of chemsex and slamsex with UAI, sdUAI, sdUAI with a detectable viral load, and diagnosis with bacterial STIs and hepatitis C using multivariable logistic regression. The associations between chemsex/slamsex and number of casual sexual partners were assessed using multivariable linear regression. All multivariable models were constructed using directed acyclic graphs (Figure S1) to determine which variables to control for [27–31]. All regressions were assessed for statistical significance with an alpha level of 5%.

Study population

A total of 4350 invitations were issued to participating clinics, representing approximately 20% of the adult HIV-infected population of each clinic. Of these, 3045 (70%) were handed out and 777 responses were received (response rate of 25.6% from all those invited to participate and 39.0% among MSM). Of the 777 respondents, 532 were classed as MSM based on self-identifying their gender as male and reporting either having had sex with a man in the last year or that their sexual orientation was gay or bisexual. After exclusion of participants who were not sexually active in the last year (i.e. those who did not report having had sex with a man in the last year), the study population consisted of 392 sexually active MSM. The total weighted population of sexually active HIV-positive MSM in the study was 24 956.

Ethics

Positive Voices was funded by the National Institute for Health Research and was reviewed by the London Harrow NHS Research Ethics Committee (Project ID 13/LO/0279). The funder had no role in the design, analysis or interpretation of the study.

Results

Of the 392 MSM who were sexually active in the past year, 102 (29.5%) reported engaging in chemsex and 34 (10.1%) in slamsex (Figure 1). Among chemsex users, the most commonly used drugs were GHB/GBL (71.6%; 68 of 102) and mephedrone (71.4%; 76 of 102). The most commonly used drugs for slamsex were crystal methamphetamine (69.2%; 24 of 34) and mephedrone (64.2%; 22 of 34). Among all MSM, 54.2% (275 of 532) had used

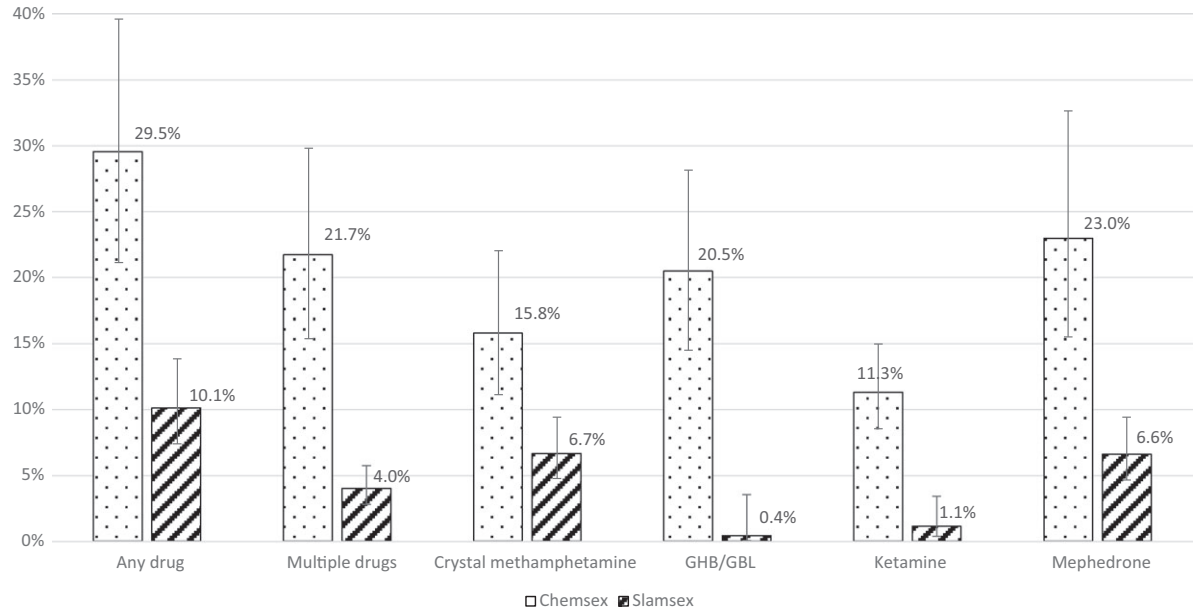

Fig. 1 Proportion of sexually active MSM who reported engaging in chemsex and slamsex over the past three months by drug type. GHB/GBL, gamma-hydroxybutyric acid/gamma-butyrolactone.

drugs in the last year and 42.5% (201 of 532) had used drugs in the last 4 weeks. Detailed drug use for all MSM is presented in Figure S2.

Chemsex was more common among participants aged 18–44 years, those living in London, those diagnosed with depression or anxiety at some point in their lives, current cigarette smokers, and those who reported non-sexual recreational drug use (Table 1). There were no differences by region of birth, education level, employment status, relationship status, binge drinking frequency, ART status, or time since HIV diagnosis. Slamsex was more common among participants who lived in London and were on ART, but no other differences were found (Table 2).

Three-quarters of participants reported UAI (72.3%; 278 of 386), with two-thirds reporting sdUAI (35.0%; 132 of 371), and one in ten reporting sdUAI with a detectable viral load (9.8%; 30 of 330). The odds of engaging in each of these behaviours was significantly higher among participants engaging in chemsex. However, for slamsex, only UAI was statistically significant (Table 3). Although a low proportion of participants engaged in sex with the highest risk of HIV transmission (i.e. sdUAI with a detectable viral load), the odds of having had this type of sex in the last year were more than three times greater if a participant engaged in chemsex than if they did not. Participants who engaged in chemsex also reported a significantly higher average number of casual partners than those who did not [31.4 versus 8.1, respectively; adjusted (mean) difference +16.4; 95% CI 12.4–20.5]; this was also the case for those who engaged in slamsex [26.4 versus 13.6, respectively; adjusted (mean) difference +12.2; 95% CI 0.73–23.7].

Over 40% (40.5%; 111 of 293) reported being diagnosed with a bacterial STI in the last year, the odds of which were significantly higher for participants who engaged in chemsex and slamsex than for those who did not (Table 4). Slamsex users were also more likely to have been diagnosed with multiple STIs in the previous year, although this association was not seen among participants who engaged in chemsex only (Table 4). In addition to bacterial STIs, participants who engaged in chemsex and slamsex also had significantly greater odds, compared with those who did not, of ever having been diagnosed with hepatitis C [chemsex: 21.9% versus 3.57%, respectively; adjusted odds ratio (AOR) 6.58; 95% CI 2.24–19.3; slamsex: 36.0% versus 5.96%, respectively; AOR 9.39; 95% CI 3.01–29.3], which was reported by 9.0% (38 of 392) of participants overall.

Discussion

Approximately one in three sexually active MSM reported sexualized drug use (chemsex) in the past year and this was strongly associated with self-reported STIs

Table 1 Profile of sexually active men who have sex with men (MSM) with HIV infection who engaged in chemsex in the UK, showing if chemsex use varied by socio-demographic characteristics

	Denominator		Any chemsex		Crystal meth		Mephedrone		GHB		Ketamine	
	Unweighted	Weighted	*n* (%)	*P*	*n* (%)	*P*	*n* (%)	*P*	*n* (%)	*P*	*n* (%)	*P*
Age group												
18–34 years	63	6302	14 (22.1)	0.02	7 (10.9)	0.055	14 (22.1)	0.13	12 (18.4)	0.14	7 (9.4)	0.44
35–44 years	97	6883	28 (34.3)		12 (15.6)		20 (26.0)		17 (23.0)		9 (10.6)	
45–54 years	146	8654	45 (35.1)		25 (21.0)		31 (25.8)		30 (24.1)		20 (14.9)	
≥55 years	86	3117	15 (18.6)		10 (11.9)		10 (12.8)		8 (9.0)		5 (7.1)	
Region of birth												
UK	294	16875	71 (28.4)	0.11	42 (17.7)	0.27	50 (21.2)	0.13	46 (19.6)	0.33	32 (13.0)	0.43
Europe	54	4143	18 (37.1)		4 (8.9)		13 (27.8)		12 (24.4)		6 (10.6)	
Africa*	8	850	1 (NA)		0 (NA)		1 (NA)		1 (NA)		0 (NA)	
Other	36	3089	12 (32.7)		8 (18.9)		11 (31.4)		8 (24.3)		3 (6.4)	
Education												
Up to qualification at 16 years	86	4593	17 (26.7)	0.83	9 (13.4)	0.41	10 (17.1)	0.09	7 (10.7)	0.06	8 (12.7)	0.49
Qualification at 18 years	74	4947	20 (32.2)		11 (18.8)		17 (28.8)		15 (25.4)		8 (10.6)	
Undergraduate	118	8048	33 (29.7)		18 (16.6)		27 (26.6)		25 (23.6)		15 (13.3)	
Postgraduate	95	6477	26 (28.3)		12 (12.8)		16 (17.6)		16 (19.0)		7 (7.8)	
Other*	12	601	4 (NA)		2 (NA)		4 (NA)		2 (NA)		2 (NA)	
Employment												
Employed	272	18060	75 (30.0)	0.15	41 (15.9)	0.30	54 (23.1)	0.07	50 (21.0)	0.14	32 (12.6)	0.47
Unemployed	23	1750	8 (39.1)		5 (23.3)		7 (37.4)		7 (33.7)		1 (4.5)	
Other†	95	4909	18 (23.8)		7 (11.7)		14 (18.5)		9 (12.9)		8 (9.6)	
Living in London												
No	216	11742	26 (17.7)	<0.001	16 (7.4)	<0.001	24 (12.8)	<0.001	22 (11.4)	0.003	18 (9.0)	0.21
Yes	176	13215	66 (40.0)		38 (23.3)		51 (32.0)		45 (28.6)		23 (13.4)	
Main partner												
No	138	9050	36 (29.8)	0.84	22 (18.6)	0.09	27 (23.9)	0.81	28 (23.2)	0.29	9 (7.5)	0.15
Yes	246	15804	62 (29.0)		28 (13.3)		47 (22.9)		47 (19.0)		31 (13.7)	
Diagnosed anxiety or depression												
No	256	16321	60 (24.6)	0.02	30 (11.5)	0.005	42 (18.1)	0.01	39 (16.2)	0.03	24 (9.8)	0.06
Yes	136	8635	42 (38.8)		24 (24.0)		33 (32.2)		28 (28.6)		17 (14.2)	
Current smoker												
No	266	16399	58 (24.2)	<0.001	29 (12.3)	0.003	40 (17.7)	<0.001	37 (16.5)	0.005	20 (8.1)	0.07
Yes	123	8521	42 (38.8)		24 (22.1)		33 (31.8)		29 (28.8)		20 (17.0)	
Binge drinking												
Less than weekly	319	20892	83 (29.4)	0.81	44 (16.0)	0.92	59 (22.1)	0.40	54 (20.4)	0.54	38 (13.0)	0.047
Weekly or more	58	3862	17 (31.5)		9 (16.7)		15 (29.1)		13 (25.6)		3 (4.9)	
Nonsexual drug use												
No	186	11733	20 (13.0)	<0.001	8 (5.5)	<0.001	13 (8.8)	<0.001	12 (7.3)	<0.001	6 (3.7)	<0.001
Yes	206	13223	82 (44.2)		46 (24.9)		62 (35.5)		55 (32.2)		35 (18.1)	
ART status												
Not on ART	36	2885	11 (35.6)	0.42	7 (20.1)	0.63	11 (35.6)	0.07	9 (26.5)	0.45	5 (13.4)	0.76
On ART	355	22061	91 (28.8)		47 (15.3)		64 (21.3)		58 (19.7)		36 (11.1)	
Time since diagnosis												
<2 years	28	1992	10 (45.3)	0.13	5 (22.8)	0.37	8 (41.1)	0.06	8 (32.3)	0.23	2 (9.2)	0.81
2–5 years	103	6990	24 (24.1)		13 (11.9)		20 (21.6)		20 (21.0)		11 (11.5)	
6–10 years	114	8058	37 (33.8)		19 (18.9)		25 (23.4)		21 (21.6)		16 (13.2)	
≥11 years	147	7917	31 (26.1)		17 (14.3)		22 (19.2)		18 (15.8)		12 (9.8)	

ART, antiretroviral therapy; GHB, gamma-hydroxybutyric acid; NA, not applicable.
Percentages represent percentages of participants in that group who engaged in chemsex and are weighted values.
*Percentages omitted because of a small denominator.
†Student, carer, retired or disabled.

(including gonorrhoea and chlamydia) and hepatitis C. It was also associated with sexual behaviours that pose a risk of onward HIV transmission, including high numbers of sexual partners, and condomless sex with partners of unknown or HIV-negative status while having a detectable viral load. Furthermore, this study showed a clustering of risk factors for poor health in MSM living in London, with chemsex being more common in MSM who were diagnosed with depression/anxiety, who smoked, and who took other recreational drugs. This

Table 2 Profile of sexually active men who have sex with men (MSM) with HIV infection who engaged in slamsex in the UK*, showing if slamsex use varied by socio-demographic characteristics

	Denominator		Any slamsex		Crystal meth		Mephedrone	
	Unweighted	Weighted	*n* (%)	*P*	*n* (%)	*P*	*n* (%)	*P*
Age group								
18–34 years	63	6302	6 (9.6)	0.19	2 (2.5)	0.09	5 (8.3)	0.08
35–44 years	97	6883	7 (8.9)		5 (7.0)		5 (3.6)	
45–54 years	146	8654	17 (13.6)		12 (10.3)		12 (9.5)	
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Region of birth								
UK	294	16875	25 (10.8)	0.65	19 (8.5)	0.30	16 (6.6)	0.77
Europe	54	4143	6 (11.4)		2 (3.2)		3 (7.3)	
Africa†	8	850	0 (NA)		0 (NA)		0 (NA)	
Other	36	3089	3 (7.7)		2 (3.4)		2 (7.7)	
Education								
Up to qualification at 16 years	86	4593	4 (6.1)	0.45	2 (3.2)	0.42	3 (4.4)	0.60
Qualification at 18 years	74	4947	6 (11.3)		3 (5.3)		4 (8.7)	
Undergraduate	118	8048	13 (12.2)		10 (8.8)		8 (7.6)	
Postgraduate	95	6477	8 (8.7)		6 (6.7)		5 (4.7)	
Other†	12	601	2 (NA)		1 (NA)		1 (NA)	
Employment								
Employed	272	18060	25 (10.3)	0.38	17 (6.8)	0.29	16 (6.5)	0.95
Unemployed	23	1750	4 (17.2)		3 (12.7)		2 (7.8)	
Other‡	95	4909	5 (7.4)		3 (4.0)		4 (6.8)	
Living in London								
No	216	11742	12 (6.0)	0.04	7 (3.3)	0.01	9 (4.5)	0.12
Yes	176	13215	22 (13.8)		16 (9.7)		13 (8.5)	
Main partner								
No	138	9050	11 (9.2)	0.53	9 (7.1)	0.44	9 (7.5)	0.61
Yes	246	15804	22 (10.3)		13 (6.1)		13 (6.3)	
Diagnosed anxiety or depression								
No	256	16321	19 (8.4)	0.31	11 (4.6)	0.04	13 (5.5)	0.48
Yes	136	8635	15 (13.4)		12 (10.5)		9 (8.6)	
Current smoker								
No	266	16399	19 (8.4)	0.15	13 (5.4)	0.32	10 (4.5)	0.03
Yes	123	8521	14 (12.8)		9 (8.4)		11 (10.0)	
Binge drinking								
Less than weekly	319	20892	28 (9.9)	0.94	18 (6.4)	0.53	19 (6.7)	0.22
Weekly or more	58	3862	5 (9.5)		5 (9.5)		2 (3.5)	
Nonsexual drug use								
No	186	11733	10 (6.9)	0.24	5 (3.3)	0.02	6 (4.5)	0.21
Yes	206	13223	24 (13.3)		18 (9.7)		16 (8.4)	
ART status								
Not on ART	36	2885	6 (20.2)	0.02	3 (7.5)	0.80	5 (17.4)	0.002
On ART	355	22061	28 (8.8)		20 (6.6)		17 (5.2)	
Time since diagnosis								
<2 years	28	1992	3 (15.9)	0.59	1 (1.5)	0.41	3 (15.9)	0.10
2–5 years	103	6990	10 (10.2)		6 (6.4)		6 (6.0)	
6–10 years	114	8058	11 (10.2)		9 (8.6)		5 (4.5)	
≥11 years	147	7917	10 (8.6)		7 (6.3)		8 (6.9)	

ART, antiretroviral therapy; NA, not applicable.
Percentages represent percentages of participants in that group who engaged in slamsex and are weighted values.
*Data on gamma-hydroxybutyric acid (GHB) and ketamine are not presented as only two and four people, respectively, reported slamsex with them.
†Percentages omitted because of a small denominator.
‡Student, carer, retired or disabled.

clustering of risk around chemsex, affecting a young and vulnerable group, suggests a syndemic of sexual ill health, drug use harms, and mental illness among HIV-positive MSM.

This was the first study of chemsex among HIV-positive MSM to use a national probability sample and, through weighting, has produced national estimates that reflect the whole population of HIV-positive MSM accessing care in the UK. Although the overall sample size was small and response rates relatively low, respondents were broadly representative of MSM in the target population [25], and thus we felt it appropriate to weight the data

Table 3 Relationship between chemsex and slamsex and sexual behaviours with a risk of onward HIV transmission

	UAI					sdUAI					sdUAI with detectable viral load				
	Denominator		Per cent reporting		AOR	Denominator		Per cent reporting	OR	AOR	Denominator		Per cent reporting	OR	AOR
	Unweighted	Weighted	UAI (95% CI)	OR (95% CI)	(95% CI)	Unweighted	Weighted	(95% CI)	(95% CI)	(95% CI)	Unweighted	Weighted	(95% CI)	(95% CI)	(95% CI)
Chemsex															
No	284	17456	64 (59–69)	1	1	277	17525	29 (25–34)	1	1	248	17296	5.9 (3.2–11)	1	1
Yes	102	6827	92 (85–96)	6.44 (3.2–13)***	5.73 (3.2–10.4)***	94	7116	48 (35–62)	2.24 (1.3–3.8)*	2.34 (1.1–4.8)*	82	6841	20 (14–26)	3.91 (1.9–8.1)**	3.86 (1.8–8.1)**
Slamsex															
No	352	22336	70 (65–75)	1	1	339	22197	34 (29–40)	1	1	305	22021	8.5 (5.5–13)	1	1
Yes	34	2545	96 (86–99)	6.90 (2.5–41)**	6.11 (1.2–30.6)*	32	2444	42 (27–59)	1.43 (0.75–2.7)	1.49 (0.58–3.9)	25	2115	23 (10–45)	3.28 (1.02–11)*	1.91 (0.46–8.0)

AOR, adjusted odds ratio; OR, odds ratio; UAI, unprotected anal intercourse; sdUAI, serodiscordant UAI.
All percentages are weighted values. Data in parentheses are 95% confidence intervals (CIs).
*$P < 0.05$; **$P < 0.01$; ***$P < 0.001$.

Table 4 Relationship between chemsex and slamsex and self-reported bacterial sexually transmitted infection (STI) diagnoses in the previous year

	Denominator		Any STI			Multiple STIs			Chlamydia			Gonorrhoea			Syphilis		
	Unweighted	Weighted	Per cent reporting any STI	OR (95% CI)	AOR (95% CI)	Per cent reporting >1 STI	OR (95% CI)	AOR (95% CI)	Per cent reporting chlamydia	OR (95% CI)	AOR (95% CI)	Per cent reporting gonorrhoea	OR (95% CI)	AOR (95% CI)	Per cent reporting syphilis	OR (95% CI)	AOR (95% CI)
Chemsex																	
No	204	15654	31% (25–38)	1	1	14% (10–21)	1	1	19% (14–26)	1	1	15% (11–21)	1	1	18% (13–24)	1	1
Yes	89	7680	60% (50–69)	3.38 (2.0–5.8)***	2.65 (1.5–4.6)**	34% (27–41)	3.03 (1.8–5.2)***	2.01 (1.0–4.1)	37% (30–44)	2.44 (1.5–4.0)**	1.98 (1.1–3.8)*	45% (38–53)	4.48 (2.9–6.8)***	3.11 (1.8–5.4)***	16% (10–25)	0.87 (0.49–1.6)	0.64 (0.36–1.1)
Slamsex																	
No	262	20612	35% (28–43)	1	1	17% (12–23)	1	1	22% (17–28)	1	1	22% (15–30)	1	1	15% (12–20)	1	1
Yes	31	2722	79% (68–87)	6.82 (3.3–14)***	6.11 (2.7–13.6)***	51% (40–61)	5.08 (3.1–8.4)***	4.00 (1.9–8.4)**	49% (35–63)	3.48 (1.7–7.0)**	3.09 (1.4–6.4)**	54% (40–68)	4.42 (1.8–11)**	3.40 (1.2–9.6)*	31% (15–54)	2.54 (1.1–6.2)*	2.85 (1.5–5.4)*

AOR, adjusted odds ratio; OR, odds ratio.
All percentages are weighted values. Data in parentheses are 95% confidence intervals (CIs).
*$P < 0.05$; **$P < 0.01$; ***$P < 0.001$.

and generalize the findings to the wider population of HIV-positive MSM accessing care. Data were collected from people linked to NHS HIV care and therefore we cannot extrapolate our findings beyond this group, meaning that they may not be representative of the entire UK MSM population living with HIV. People not linked to HIV care, or who are unaware of their HIV status, may be more likely to engage in risky sexual practices and be more likely to transmit HIV, possibly making the estimates herein conservative for the overall population [32,33]. There was also the possibility that our estimates of chemsex and STIs were conservative as a consequence of social desirability bias leading to underreporting of such behaviours. To minimize this problem, data were collected using a web-based self-interview, which has been found to increase disclosure of sensitive and stigmatized behaviour [34,35]. Importantly, the data on viral load were not self-reported, avoiding reporting bias for this parameter.

As with all cross-sectional studies, our findings represent associations only and we cannot be certain that chemsex occurred at the same time as sex with a high risk of HIV transmission, or make causal inferences, such as stating that chemsex causes people to engage in riskier sex. Indeed, the 1-year reference period for the measures is a limitation of the study, with relationships between chemsex and specific sexual practices better analysed using sexual encounter-level data. Despite this, previous reports from the UK have indicated that chemsex is often associated with more sexual partners, higher HIV risk sex, and not taking antiretroviral drugs, meaning that there is an increased likelihood that participants would have had a detectable viral load during their chemsex sessions [6,9–11,13,36,37].

Irrespective of causality or the sequence of events, our findings show that taking drugs before or during sex is linked to a higher number of sexual partners, higher levels of high-risk sexual behaviours, and increased STI diagnoses, which is in line with previous findings in the UK [13,16]. Additionally, we have highlighted that HIV-positive MSM engaged in chemsex are more likely to have mental health issues and other addictive behaviours, and that these risks and morbidities are occurring in the same individuals. Attention must therefore be paid not only to the association between chemsex, STIs, the hepatitis C epidemic, and behaviours that are driving the HIV epidemic, but also to its impact on the overall health of HIV-positive MSM. Given this potentially devastating syndemic, the fact that chemsex appears to be on the increase [6,8,19,20], chemsex being linked to increases in HIV incidence in MSM [9,13,21,22] and increases in STI diagnoses in MSM [15,16], and that it can cause severe side effects and even death [36,38,39], it is becoming ever more important to address chemsex as a public health priority.

To address chemsex and the syndemic surrounding it, there is a need for a joined-up response between HIV treatment, mental health, addiction, and sexual health services. Traditional drug dependence services, which focus on opiate use, have had poor uptake by MSM [40], probably because their current configuration is not suited to addressing the needs of MSM and the sexual nature of their drug use [9]. There is evidence that MSM who engage in chemsex prefer to receive drug counselling services based in sexual health clinics, which traditionally have high attendance levels from MSM in the UK [7]. Indeed, some sexual health clinics in London are offering focussed chemsex programmes with trained staff and chemsex care plans for patients [7,41,42]. Although these programmes have found high levels of acceptability and uptake among MSM engaging in chemsex [19,36], they remain in their infancy and their effectiveness has not yet been fully evaluated [7,43].

Future research should therefore focus on ways of addressing the syndemic of ill health, drug use harms, and mental illness among HIV-positive MSM. Such research should take a broad public health approach that includes examining the possible social and cultural determinants. The need for holistic approaches to health among MSM has been emphasized in Public Health England's MSM strategic action plan and its commissioner's toolkit for chemsex, which highlight the interactions between health, substance use, and sexual risk behaviours [44,45]. Therefore, service evaluations and the development and testing of a set of best-practice guidelines for helping health care staff, including general practitioners [38], to manage patients should be prioritized. Developing a robust evidence base around the wider issues surrounding chemsex and how to best help men who are engaged in chemsex to remain safe must be priorities going forward.

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Author contributions

EP wrote the statistical analysis plan, cleaned and analysed the data, and drafted and revised the paper; MK designed data collection tools, monitored data collection for the whole trial, and drafted and revised the paper; MS, AN and RG designed data collection tools, monitored data collection for the whole trial, and revised the draft paper; VD designed data collection tools, monitored data collection for the whole trial, and drafted and revised the draft paper; HW wrote the statistical analysis plan and drafted and revised the paper.

Appendix: Positive Voices

The Positive Voices study group: Professor Graham Hart [University College London (UCL)], Professor Jane Anderson [Public Health England (PHE)], Mr Yusef Azad (National AIDS Trust), Professor Jonathan Elford (City University), Professor Helen Ward (Imperial College), Dr Valerie Delpech (PHE), Dr Anthony Nardone (PHE), Dr Richard Gilson (UCL), Dr Maryam Shahmanesh (UCL), Dr Ann Sullivan (Chelsea & Westminster Hospital), Dr Cath Mercer (UCL), Dr Alan McOwan (Chelsea & Westminster Hospital), Jess Peck (NHS England), Professor Jackie Cassell (Brighton and Sussex Medical School), Ms Julie Musonda (UK Community Advisory Board UK-CAB), Ms Jane Bruton (National HIV Nurses Association NHIVNA) and Ms Meaghan Kall (PHE).

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Supporting Information

Additional Supporting Information may be found in the online version of this article at the publisher's web-site:

Fig. S1. Causal diagram used to inform multivariable regression models.
Fig. S2. Recreational drug use among all MSM.