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ORIGINAL RESEARCH

Chemsex drugs on the rise: a longitudinal analysis of the Swiss HIV Cohort Study from 2007 to 2017

B Hampel,[1,2,3,*] K Kusejko,[1,2,*] RD Kouyos,[1,2] J Böni,[2] M Flepp,[4] M Stöckle,[5] A Conen,[6] C Béguelin,[7] P Künzler-Heule,[8] D Nicca,[8] AJ Schmidt,[9] H Nguyen,[1,2] J Delaloye,[10] M Rougemont,[11] E Bernasconi,[12] A Rauch,[7] HF Günthard,[1,2] DL Braun[1,2,*] and J Fehr[1,3,*] for the Swiss HIV Cohort Study group[†]

[1]Division of Infectious Diseases and Hospital Epidemiology, University Hospital Zurich, University of Zurich, Zurich, Switzerland, [2]Institute of Medical Virology, University of Zurich, Zurich, Switzerland, [3]Department of Public Health, Epidemiology, Biostatistics and Public Health Institute, University of Zurich, Zurich, Switzerland, [4]Center of Infectious Diseases Zurich, Zurich, Switzerland, [5]Division of Infectious Diseases & Hospital Epidemiology, University Hospital Basel, University Basel, Basel, Switzerland, [6]Division of Infectious Diseases and Hospital Hygiene, Cantonal Hospital Aarau, Aarau, Switzerland, [7]Department of Infectious Diseases, Bern University Hospital, University of Bern, Bern, Switzerland, [8]Institute of Nursing Science, University of Basel, and University Hospital Basel, Basel, Switzerland, [9]Division of Infectious Diseases, Cantonal Hospital St. Gallen, St. Gallen, Switzerland, [10]Division of Infectious Diseases, University Hospital Lausanne, Lausanne, Switzerland, [11]Division of Infectious Diseases, University Hospital Geneva, Geneva, Switzerland and [12]Division of Infectious Diseases, Regional Hospital Lugano, Lugano, Switzerland

Objectives

Chemsex refers to the use of sex-enhancing drugs among men who have sex with men (MSM) in combination with specific sexual and social behaviours. Longitudinal data on this development and the associated health risks are scarce.

Methods

Data on all recreational drugs reported in the Swiss HIV Cohort Study (SHCS) from 2007 to 2017 were collected. Drug use was analysed longitudinally for all drug classes. In addition, potential associations between patient characteristics and the consumption of methamphetamine, γ-hydroxybutric acid/γ-butyrolactone (GHB/GBL), 3,4-methylenedioxymethamphetamine (MDMA/XTC), cocaine and amphetamine were analysed.

Results

We analysed 166 167 follow-up entries for 12 527 SHCS participants, including 7101 free text field entries containing information about recreational drugs other than cannabis, cocaine and heroin. Overall, we observed a stable percentage (9.0%) of recreational drug use (excluding cannabis, amyl nitrite and prescription drugs). For MSM, however, there was an increase in overall drug use from 8.8% in 2007 to 13.8% in 2017, with particularly large increases for methamphetamine (from 0.2 to 2.4%; $P < 0.001$) and GHB/GBL (from 1.0 to 3.4%; $P < 0.001$). The use of each of the potentially sex-enhancing drugs methamphetamine, GHB/GBL, cocaine, XTC/MDMA and amphetamine was significantly associated with condomless sex with nonsteady partners, and higher prevalences of depression, syphilis and hepatitis C.

Conclusions

The significant increase in the use of chemsex drugs among MSM in the SHCS and the strong association with coinfections and depression highlights the need for harm reduction programmes tailored to MSM. According to our results, improving knowledge about recreational drugs is important for all health care professionals working with people living with HIV.

Correspondence: Drs Benjamin Hampel and Katharina Kusejko, Division of Infectious Diseases and Hospital Epidemiology, University Hospital Zürich, Rämistrasse 100, CH-8091 Zürich, Switzerland. Tel/fax: 0041 44 2553322; e-mails: HansBenjamin.Hampel@usz.ch (BH); katharina.kusejko@usz.ch (KK)

*These authors contributed equally to this work.

[†]The members of the Swiss HIV Cohort Study group are listed in the Acknowledgements section.

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Introduction

A growing number of reports across multiple countries show a new trend of sex-enhancing drug use among men who have sex with men (MSM), often referred to as chemsex [1–3]. Chemsex defines a syndemic of specific social and sexual behaviours associated with specific recreational drugs ('chems') among MSM before or during sex, wide use of geosocial networking applications (apps) and sex with a high number of partners in a mostly private setting [1,2]. Drugs often referred to as chemsex drugs typically include N-methylamphetamine (methamphetamine), 4-methyl methcathinone (mephedrone), γ-hydroxybutyric acid/γ-butyrolactone (GHB/GBL) and sometimes ketamine [1,2]. For Switzerland, in 2010 the European MSM Survey (EMIS) showed that all of these drugs were already in use by MSM and that 7% of MSM in Zurich reported use of GHB/GBL, ketamine, methamphetamine or mephedrone in the previous 4 weeks [3]. Despite this, the Swiss Federal Office of Public Health (FOPH) in 2015 concluded that there was no significant methamphetamine usage in Switzerland [4]; however, their analysis did not focus on the HIV-positive population or MSM.

In addition to the direct risk of bloodstream transmission of HIV, hepatitis B virus (HBV) and hepatitis C virus (HCV) infection through needle sharing associated with recreational drug use (RDU), RDU itself has been well studied as a risk factor for sexually transmitted infections (STIs) as a consequence of the associated increase in risky sexual behaviours such as condomless sex and having a high number of sexual partners [5–8]. The availability of new substances and the change in sexual behaviour resulting from the use of geosocial networking apps come with new challenges for health care professionals, such as prevention and treatment of infectious and psychiatric diseases [9–11]. This change in sexual behaviour might also be one reason for the growing number of STIs among MSM [12,13]. The extent of this new development has, to date, not been well studied longitudinally.

The aim of this study was to analyse the trend in the consumption of all recreational drugs over the last 11 years among all participants in the Swiss HIV Cohort Study (SHCS), with a particular focus on the use of chemsex drugs and other potentially sex-enhancing drugs among MSM. In addition, we compared characteristics of participants who reported using recreational drugs (excluding cannabis, amyl nitrite and prescription drugs) at least once during the study period to those of participants who did not report RDU at any follow-up visit.

Methods

Study design

The SHCS, launched in 1988, is a prospective cohort study with ongoing enrolment of HIV-diagnosed individuals in Switzerland. Of the approximately 20 000 participants in total, around 40% are MSM [14]. It is estimated that about 84% of all HIV-positive MSM living in Switzerland participate in the SHCS [15]. Detailed clinical, laboratory, demographic and behavioural data are recorded at study entry and every 6 months thereafter. The SHCS collects data at seven centres in Zurich, Basel, Bern, Geneva, Lausanne, Lugano and Sankt Gallen, as well as from associated hospitals, clinics and collaborating physicians specializing in HIV care.

Study population

All patients enrolled in the SHCS with at least one visit between 2007 and 2017 were included. For this study, MSM are defined as male participants reporting a homosexual or bisexual preference. All other participants were categorized as non-MSM.

Study measurements

Data collection

The SHCS questionnaire is completed every 6 months by a health care professional in an interview with the participant. Since 2007, all SHCS participants have been asked about RDU. Data on heroin, cocaine and cannabis use are collected in the form of binary variables. For other drugs, more detailed information in two free text fields, one for intravenous drugs and one for nonintravenous drugs, can be provided. We combined information on intravenous and nonintravenous drug use of the same substance and did not analyse the mechanism of administration separately. We included information about the mechanism of administration as well as the amount of clearly misclassified entries in the 'Data quality' section and Appendix 1.

Substances of interest

A pattern search algorithm was applied to the text fields containing information about drug use, and all entries were categorized into one of 16 drug classes (see Table A1 and Appendix 1): chemsex drugs (GHB/GBL, methamphetamine, ketamine and mephedrone), other sex-enhancing drugs [cocaine, 3,4-methylenedioxymethamphetamine (XTC/MDMA), amyl nitrite and amphetamine] and other

drugs [cannabis, heroin, benzodiazepines, opioids other than heroin, lysergic acid diethylamide (LSD) or other psychogenic drugs, methylphenidate, anabolic substances and other prescription drugs]. Entries that could not be categorized by the algorithm were assigned to one of the drug classes by the authors, if possible, or left out of the analysis. The results were then combined with the binary entries for cocaine, cannabis and heroin.

First, we performed an analysis of the overall use of all 16 drug classes. Secondly, the time trend for all chemsex drugs and other potentially sex-enhancing drugs (excluding the less harmful substance amyl nitrite) was analysed for all SHCS participants, as well as for MSM and non-MSM separately. For the comparison of participants who ever reported drug use with participants who never reported drug use during the whole follow-up period, we concentrated on the two most important chemsex drugs, GHB/GBL and methamphetamine, in addition to all other potentially sex-enhancing drugs (again excluding the less harmful substance amyl nitrite).

Association between drug use and sociodemographic, psychosocial and behavioural measures

All SHCS participants are screened every 2 years for HCV (MSM yearly) and every year for syphilis. Since 2000, all participants have routinely been asked whether they have had anal or vaginal sex with casual partners and whether condoms were used all the time. Since 2003, patients have routinely been asked how often they have missed a dose of antiretroviral therapy (ART). The level of self-reported ART adherence is classified as follows: the answers 'never' and 'once a month' are grouped under 'good adherence', the answers 'once per week' and 'once every second week' are grouped under 'medium adherence', and the answers 'more than once per week' and 'every day' are grouped under 'poor adherence'. These adherence categories correlate well with viral suppression and mortality [16]. In 2008, a binary variable for depression was introduced, which relies on patient self-reporting [17]. Lastly, three education categories are used: patients who did not finish any education or only 9 years of mandatory school education, patients who finished an apprenticeship or A levels, and those who completed higher education including university.

Statistical analysis

Time trend of drug use

To analyse the time trend of drug use in the SHCS, we extracted the number of patients using the different drugs for each year from 2007 to 2017. In the event of more than one follow-up visit per year for the same patient, the information was combined; that is, we included the information on whether this patient reported drug use at least once during the year of interest. We used generalized estimating equations (R package 'geepack') to account for correlated responses from participants over time.

Association between drug use and sociodemographic, psychosocial and behavioural measures

We determined whether drug use among MSM was significantly associated with the level of education, condomless sex, depression, adherence to ART, detectable HIV viral load, and HCV or syphilis coinfection. In particular, we compared MSM who had used methamphetamine, GHB/GBL, cocaine, XTC/MDMA or amphetamine, respectively, at least once during the whole follow-up time with a control group. The control group consisted of MSM who, at all follow-up visits in the years 2007–2017, either reported no recreational drug use or only the use of cannabis or amyl nitrite, as these drugs are often considered less harmful [18]. We did not include prescription drugs in our analysis, as information regarding whether the substance was used as prescribed or was abused was unavailable. We analysed the above-mentioned factors using logistic regression, univariable as well as adjusted for the sociodemographic factors age, ethnicity and year of diagnosis. MSM reporting use of the substances of interest were compared against the control group with no drug use, respectively. Data analysis was performed with R (version 3.3.0)[19].

Data quality check

To assess the quality of our data and to elucidate potential flaws in the way the data were collected, we performed a descriptive analysis of three aspects of the data. First, we counted the number of different spellings of the same substance to assess potential ambiguities in the classification. Secondly, we counted the number of entries that could not be assigned to any of the 16 drug classes because of vague description of the substances. Thirdly, we counted the number of entries that were placed in the wrong category regarding the mechanism of administration, that is, intravenous versus nonintravenous. Additionally, we compared the data to a currently unpublished data set based on an online questionnaire taken by 109 SHCS participants for the Swiss HCVree trial, a substudy of the SHCS which aims to screen and treat all SHCS participants for HCV[20].

Results

Study population and overall drug use in the SHCS

During the study period 2007–2017, information on cocaine, cannabis and heroin use was available for

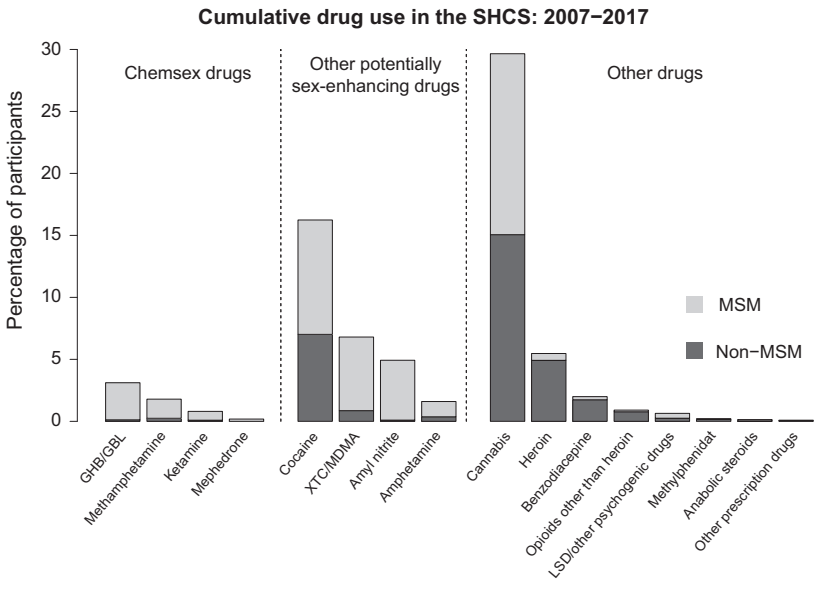

Fig. 1 The percentage of participants who had used the drug at least once during the follow-up period of 2007–2017. GHB/GBL, γ-hydroxybutric acid/γ-butyrolactone; LSD, lysergic acid diethylamide; XTC/MDMA, 3, 4-methylenedioxymethamphetamine.

12 527 SHCS participants, of whom 5657 (45.2%) were MSM and 6870 (54.8%) were non-MSM (female or heterosexual male). Almost half of all MSM were registered in Zurich (47.2%). Information from 166 167 total visits was available, and, of those, only 2086 (1.3%) visit entries did not contain any information about drug use. Overall, 1840 (14.7%) of the participants reported substance use in the free text field. In detail, we could identify 7101 substances reported at 5840 follow-up visits from these 1840 participants. In total, we identified 408 different spellings of substances reported (see Appendix 1). Overall, 4686 (37.4%) of all SHCS participants reported the intake of any kind of recreational drug at least once during the study period. Excluding cannabis, amyl nitrite, benzodiazepines and other prescription drugs, 2560 (20.4%) of the SHCS participants reported having taken recreational drugs in this period. See Fig. 1 for a summary of the drug classes considered.

Time trend of drug use in the SHCS

To elucidate the changes in drug use over time, we analysed the typical chemsex drugs GHB/GBL, methamphetamine, ketamine and mephedrone, but also other potentially sex-enhancing drugs used in the SHCS, namely cocaine, XTC/MDMA and amphetamine. We looked at the percentage of SHCS participants using the drugs at least once in each year (Fig. 2a). In addition, we looked at the time trend of the proportion of participants reporting drug use, again excluding cannabis, amyl nitrite, benzodiazepines and other prescription drugs. This proportion remained stable, with 9.0% of participants reporting drug use (range 8.6, 9.5%; P for trend = 0.57). However, in contrast to the whole SHCS population, there was a significant increase (P for trend < 0.001) towards more drug use among MSM: the report of drug use increased from 8.8% to 13.8% from 2007 to 2017 (Fig. 2b). For non-MSM, we observed the opposite trend (P for trend < 0.001), namely 9.8% reporting drug use in 2007 and 5.7% reporting drug use in 2017 (Fig. 2c).

Drug use among MSM

Many of the drug classes considered were predominately taken by MSM, such as XTC/MDMA, GHB/GBL, ketamine and methamphetamine (Fig. 1). Data on reported drug use from 5657 MSM for the years 2007–2017 show that 2510 (44.4%) reported drug use at least once during the study period and, if we exclude cannabis, amyl nitrite, benzodiazepines and other prescription drugs, the number remains high at 1468 or 25.9% of all MSM in the study. Analysis of the time trend for chemsex drugs and other potentially sex-enhancing drugs revealed an increase in the use of all these substances (Fig. 2b). In particular, when comparing the years 2007 and 2017, we observed an increase in the use of GHB/GBL (from 1.0 to 3.4%; P for trend < 0.001), methamphetamine (from 0.2 to 2.4%; P for trend < 0.001), ketamine (from 0.1 to 0.7%; P for trend = 0.016), mephedrone (from 0.0 to 0.2%; P for trend = 0.006), cocaine (from 6.2 to 9.9%; P for trend < 0.001), XTC/MDMA (from 3.2 to 5.3%; P for trend = 0.0014) and amphetamine (from 0.4 to 1.0%; P for trend < 0.001).

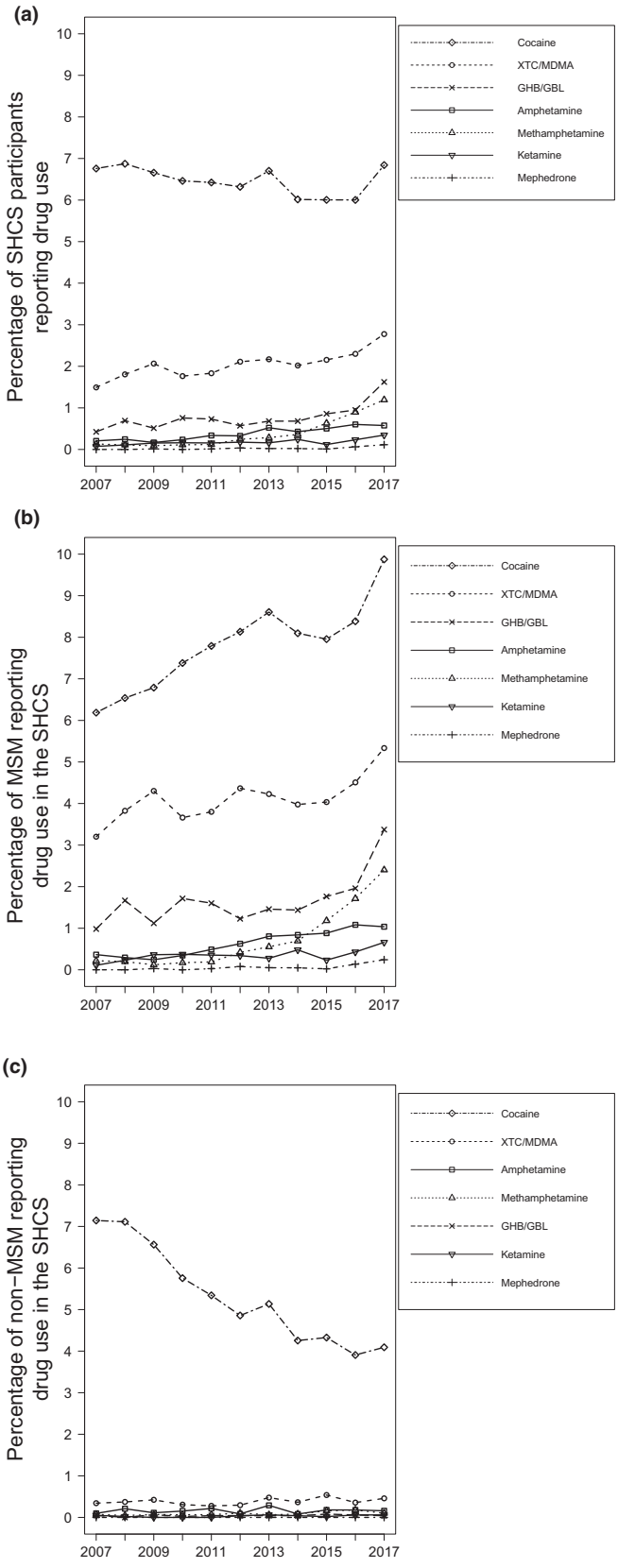

Fig. 2 Time trend of drug use in the SHCS for the whole study population, for MSM and for non-MSM. (a) Percentage of Swiss HIV Cohort Study (SHCS) participants reporting the use of various drugs, by year and drug class. GHB/GBL, γ-hydroxybutric acid/γ-butyrolactone; XTC/MDMA, 3,4-methyleneioxymethamphetamine. (b) The percentage of all men who have sex with men (MSM) participants in the SHCS reporting the use of various drugs, by year and drug class. (c) The percentage of non-MSM participants in the SHCS reporting the use of various drugs, by year and drug class.

Factors associated with drug use

Most participants reporting drug use were from the study centre in Zurich (Fig. 3). The total number of participants reporting drug use in the seven SHCS centres as well as patient characteristics can be found in Table 1. A significant association between drug intake and condomless sex with occasional partners was found for the five substances of interest, namely methamphetamine, GHB, cocaine, XTC/MDMA and amphetamine, compared to those MSM not using sex-enhancing drugs (Table 1; Fig. 4). All subgroups of drug classes had a significantly higher prevalence of depression. Moreover, adherence to ART was significantly lower for users of GHB/GBL, cocaine and amphetamine compared to the control group. HCV infection and syphilis were more frequent among drug users for all five drug classes considered (Table 1).

Data quality

Health care professionals used a variety of different names to describe the same drug; for example, 72 different spellings/names were used for methamphetamine (Table A1; Appendix 1). In total, we could identify 408 different wording and spellings. Especially for two different substances with similar names, such as methamphetamine and amphetamine, this leads to ambiguity in some cases. Moreover, some entries only vaguely described what substances were taken, such as 'party drugs', and could hence not be used in the analysis of different drug classes. In addition, the health care professionals grouped the drugs into intrevenous and nonintravenus drugs (see Appendix 1). Here, 42 of 811 (5.2%) entries in the category for intrevenous substances belonged to substances that cannot be intrevenous; for example, amyl nitrite, GHB/GBL and MDMA were reported in the intrevenous category, and there were many other entries in this category where injection is unlikely. We were also able to compare the data with as yet unpublished results from the Swiss HCVree trial [20]. In this trial, a subpopulation of 109 participants in the SHCS completed an online questionnaire on recreational drug use during the same study period. Eighty-six of the 109 reported recreational drug use when asked about it in the online questionnaire compared to 33 reports from a one-to-one interview with a health care professional during the SHCS visit.

Discussion

This study investigated longitudinal population-based data on recreational drug use among people diagnosed with HIV infection in Switzerland. The time trend for drug use was analysed longitudinally over an 11-year period to elucidate patterns of use of different substances over time as well as different dynamics of drug use when comparing MSM and non-MSM. In addition, we compared potential risk factors for drug use between participants who reported drug use at least once in these 11 years and participants who never reported drug use. When MSM and non-MSM were analysed separately, we found a large disparity in recreational drug use over time between the two groups: for MSM, there was a significant increase in overall drug consumption, whereas for non-MSM there was a decrease. This increase remained significant when less harmful illicit drugs were excluded. The

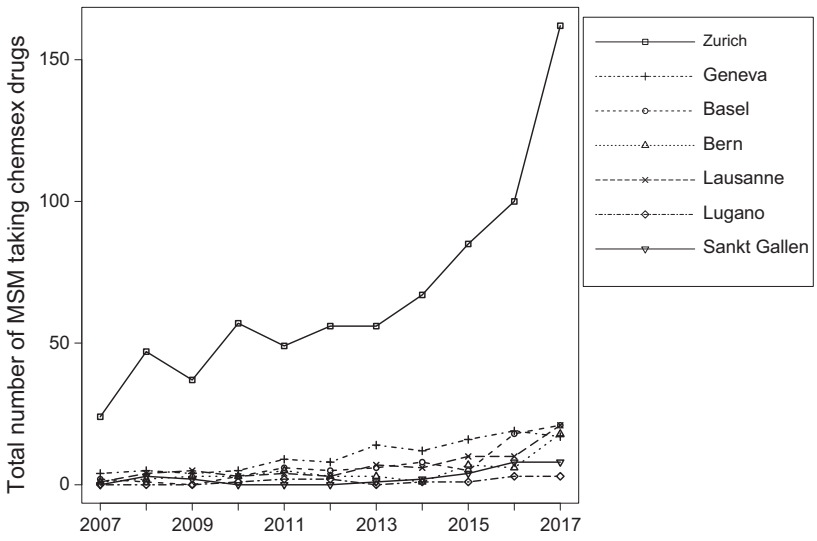

Fig. 3 Total number of men who have sex with men (MSM) participants taking chemsex drugs, i.e. γ-hydroxybutric acid/γ-butyrolactone (GHB/GBL), methamphetamine, mephedrone or ketamine, by Swiss HIV Cohort Study (SHCS) centre.

Table 1 Sociodemographic, psychosocial and sexual behaviour measures for men who have sex with men (MSM) reporting drug use of γ-hydroxybutric acid/γ-butyrolactone (GHB/GBL), methamphetamine, cocaine, 3,4-methylenedioxymethamphetamine (XTC/MDMA) or amphetamine, or reporting no drug use other than cannabis, amyl nitrite, benzodiazepines and other prescription drugs

	GHB/GBL users	Methamphetamine users	Cocaine users	XTC/MDMA users	Amphetamine users	No drug use
Total [*n* (%)]	375 (6.6)	194 (3.4)	1156 (20.4)	744 (13.1)	154 (2.7)	4191 (74.1)
SHCS centres [*n* (% of participants in that centre)]						
Zurich	264 (9.9)	121 (4.5)	667 (25.0)	533 (19.9)	98 (3.7)	1804 (67.5)
Basel	19 (3.3)	18 (3.1)	79 (13.7)	39 (6.7)	23 (4.0)	474 (82.0)
Bern	9 (1.5)	20 (3.3)	79 (12.9)	34 (5.5)	16 (2.6)	510 (83.1)
Geneva	41 (5.9)	12 (1.7)	142 (20.6)	50 (7.2)	3 (0.4)	525 (76.1)
Lausanne	27 (3.7)	12 (1.7)	144 (19.9)	65 (9.0)	4 (0.6)	555 (76.9)
Lugano	5 (3.3)	4 (2.7)	13 (8.7)	6 (4.0)	1 (0.7)	134 (89.3)
Sankt Gallen	10 (4.3)	7 (3.0)	32 (13.7)	17 (7.3)	9 (3.9)	189 (81.1)
Age (years)						
Median (min, max) for 2007–2016	40.7 (39.0, 43.0)	39.7 (36.0, 44.5)	41.1 (39.0, 44.0)	39.5 (38.5, 41.5)	39.3 (35.0, 42.0)	47.4 (45.0, 50.0)
Ethnicity [*n* (% of that ethnicity)]						
White	345 (6.8)	170 (3.3)	1001 (19.6)	656 (12.9)	144 (2.8)	3820 (74.9)
Black	4 (3.9)	0 (0.0)	25 (24.5)	9 (8.8)	3 (2.9)	74 (72.5)
Hispano-American	21 (7.5)	10 (3.6)	92 (32.7)	49 (17.4)	3 (1.1)	178 (63.3)
Asian	8 (4.4)	14 (7.7)	40 (22.1)	30 (16.6)	4 (2.2)	121 (66.9)
Education [*n* (%)]						
None/mandatory	33 (8.8)	22 (11.5)	129 (11.3)	80 (10.9)	22 (14.3)	380 (9.3)
Apprenticeship/high school	188 (50.4)	89 (46.4)	574 (50.4)	375 (50.9)	94 (61.0)	2003 (48.9)
Higher education	152 (40.8)	81 (42.2)	436 (38.3)	282 (38.3)	38 (24.7)	1717 (41.9)
Condom use [*n* (%)]						
Condomless sex with occasional partners at least once	338 (90.1)	170 (88.1)	809 (70.1)	576 (77.5)	123 (79.9)	1556 (37.2)
Depression [*n* (%)]	174 (46.9)	106 (55.2)	577 (50.3)	323 (43.8)	84 (54.5)	1431 (34.9)
Adherence [*n* (%)]						
Poor adherence	29 (8.0)	15 (8.2)	127 (11.4)	62 (8.6)	16 (10.4)	315 (7.8)
Medium adherence	50 (13.8)	27 (14.7)	170 (15.3)	87 (12.1)	24 (15.6)	419 (10.4)
Good adherence	284 (78.2)	142 (77.2)	816 (73.3)	571 (79.3)	114 (74.0)	3289 (81.8)
Viral load [*n* (%)]						
Mean viral load > 200 copies/mL	10.4	9.55	11.45	10.1	9.52	9.67
HCV [*n* (%)]						
HCV infected	53 (14.5)	46 (25.0)	172 (15.3)	101 (14.0)	17 (11.3)	245 (5.9)
Syphilis [*n* (%)]						
Syphilis at least once during follow-up time	161 (43.2)	97 (50.8)	431 (37.5)	280 (37.8)	62 (40.3)	860 (20.8)

HCV, hepatitis C virus; SHCS, Swiss HIV Cohort Study.

most relevant finding is the 12-fold increase in methamphetamine use and the > 3-fold increase in GHB/GBL use. Unfortunately, the SHCS questionnaire does not ask about the setting in which a substance is consumed. However, we observed a significant association between the consumption of these recreational drugs and indicators for risky sexual behaviour, namely condomless anal sex with occasional partners and a high prevalence of HCV infection and syphilis. These findings indicate that the chemsex trend has reached Switzerland, and is most prevalent in the region of Zurich.

Our study shows a strong association between depression and the use of all analysed substances. It is well known that depression can lead to a greater tendency to take more sexual risks [21]. However, our study did not address the complexity of the interaction between depression and other sexual risks, as many important questions, such as internalized homophobia or alcohol misuse, were not included in our analysis.

The chemsex scene is difficult to study and probably underestimated by health care professionals and authorities. The difficulties in collecting data on sexualized drug use are well known [22]. With the exceptions of the heroin epidemic of the 1980s and 1990s, which took place mostly in public spaces [23], and the rise of XTC/MDMA in the 1990s in the club scene [24,25], chemsex drugs are usually consumed in a private setting and obtained differently from other drugs, for example via geosocial networking apps [1]. This might be the reason why our data on methamphetamine substantially differ from the results of the analysis performed by the FOPH, which did not focus on the HIV-diagnosed or MSM population [4]. It might also be that people who consume chemsex drugs do not attend the health care facilties where interviews were carried out by

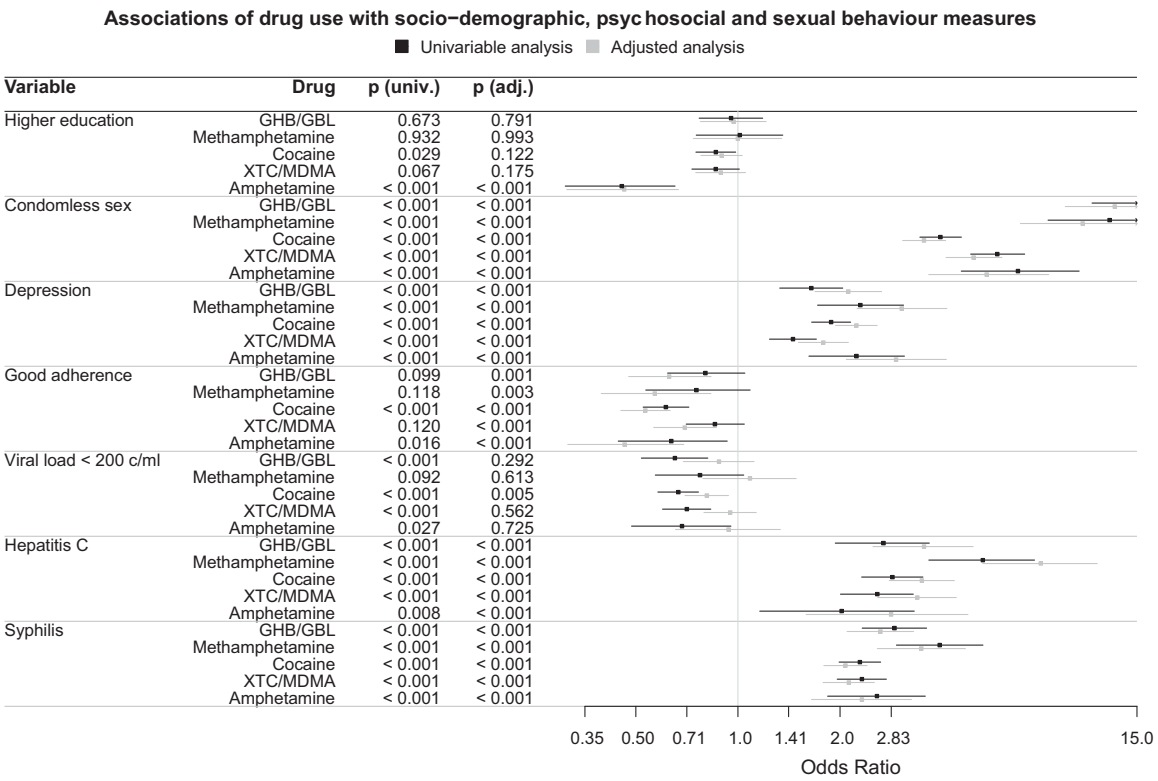

Fig. 4 Analysis of sociodemographic, psychosocial and sexual behaviour measures for men who have sex with men (MSM) reporting drug use of γ-hydroxybutric acid/γ-butyrolactone (GHB/GBL), methamphetamine, cocaine, 3,4-methylenedioxymethamphetamine (XTC/MDMA) and amphetamine in comparison to MSM participants reporting no drug use other than cannabis, amyl nitrite, benzodiazepines and other prescription drugs. In the adjusted analysis, we corrected for the basic sociodemographic factors age, ethnicity and year of diagnosis. adj., adjusted; Univ., univariable.

the FOPH for their study. Another difficulty when studying the chemsex phenomenon is the potential participant reservation regarding sharing such sensitive personal information in view of possible perceived shaming or unsolicited moralizing by the health care professional. This might explain the difference between the results of the patient interview from the SHCS and the online questionnaire from the Swiss HCVree trial. Based on this observation, all data presented above can be considered as a lower bound for drug use among SHCS patients. Furthermore, considering the numerous colloquial terms for the drugs recorded in the SHCS, often with incorrect spelling (see Table A1, Appendix 1), we assume that knowledge about these substances is rather limited among Swiss health care professionals.

As our study is the first to provide longitudinal data on recreational drug use among MSM living with HIV, our results are difficult to compare with those of other studies in the field. However, the study suggests that the use of chemsex drugs among MSM living with HIV seems to be lower in Switzerland than in the UK [5]. This is consistent with the 2010 EMIS survey among HIV-positive and HIV-negative MSM [3]. In addition, our study shows almost no use of mephedrone among HIV-positive MSM in Switzerland. The reason why mephedrone did not become as popular in Switzerland as in the UK has, to the best of our knowledge, never been studied. We see the overall decline in recreational drug use among non-MSM as further evidence of the success of preventative measures, such as safe injection sites and drug substitution programmes, for those who have previously used intravenous heroin [12,26].

This study has several strengths and some limitations. Most importantly, we were able to analyse prospective data on recreational drug use amongst people diagnosed with HIV infection from an 11-year period and identify possible risk factors associated with this behaviour. The SHCS includes the majority of the HIV-diagnosed Swiss population and is therefore highly representative for this population. As a limitation, our data quality check revealed that drug consumption in the study population is probably considerably underestimated. Furthermore, we do not have information about the setting in which these

drugs were consumed. Also, in view of the long study period of 11 years, we did not include multi-drug use when analysing the associated risk factors. Another limitation is that we only had information about people diagnosed with HIV infection and thus it is unclear whether this trend is also seen among HIV-seronegative MSM to the same extent. This information will be crucial to furthering our understanding of the contribution of the phenomenon of chemsex to the ongoing high numbers of new HIV diagnoses among MSM [12].

Our findings call for action and have several implications for daily practice. First, we recommend that questionnaires on recreational drug use need to be adapted to account for these new trends. For example, we suggest that standardized data collection is used for all recreational drugs on these forms instead of free text data entry. Secondly, we believe that health care professionals working with MSM and other people at risk must be aware of the latest developments related to chemsex in order to ensure expert knowledge about these substances. In addition, these health care professionals should be trained in communication skills to be able to recognize and address problematic drug use and its related health issues and provide low-threshold support. Thirdly, new preventive strategies need to be developed. As the increase in the use of chemsex drugs is mainly seen among the MSM population in certain hot spots, such as in Zürich, prevention programmes should be located in these regions and should be adapted to the specific needs of the MSM population. In addition to creating awareness of the psychological risks that accompany these drugs, such programmes must also involve harm reduction for the prevention of infectious diseases.

In conclusion, our study identified a significant increase in the use of chemsex drugs, in particular methamphetamine and GHB/GBL, among MSM diagnosed with HIV infection in Switzerland and a strong association of this use with coinfections and depression. In light of these findings, more studies in this field are needed to better understand the relationship between sexual behaviour, drug consumption and depression in order to inform successful harm reduction strategies. This further understanding will not only help our patients and potentially decrease numbers of other STIs, including viral hepatitis C, but will also be crucial to our understanding of the current drivers in the ongoing HIV epidemic.

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Ethics approval and consent to participate

The SHCS was approved by the ethics committees of the participating institutions (Kantonale Ethikkommission Bern, Ethikkommission des Kantons St. Gallen, Comité Departemental d'Ethique des Specialités Medicales et de Medicine Communataire et de Premier Recours, Kantonale Ethikkommission Zürich, Repubblica et Cantone Ticino–Comitato Ethico Cantonale, Commission Cantonale d'Étique de la Recherche sur l'Être Humain, Ethikkommission beider Basel for the SHCS and Kantonale Ethikkommission Zürich for the ZPHI). Written informed consent was obtained from all participants.

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Appendix 1

1. Assignment of free text entries to drug classes

The free text entries given by health care professionals were grouped into 16 different drug classes. See Table A1 for the drug classes, the different entries found and the number of different entries, i.e. spellings and drug names found. In addition, the last row of Table A1 lists those entries that could not be assigned.

Table A1 Entries assigned to different drug classes. 'Count' denotes the number of different spellings found

Drug class	Entries	Count
Amphetamine	AMPHETAMIN, AMPHETAMINE, AMPHETAMINES, AMPHÉTAMINE, SPEED, AMPHETAMINS, AMPHET, AMPHETT, AMPFETAMINE, AMPETHAMINE, PHENYLAETHYLAMPHETAMIN, AMPHET., AMPHETAMON, AMPHE, AMPHÉTAMINES, AMPHETAMINI, AMP, AMPHETAMINE., AMPETH, METYLAMPHETAMIN, AMPHETHAMIINE, SPEEDY, SPEED., SPEEDS, PHENYLAETHYLAMIN, DIMETHOXY, DIMETHOXI, METHYLETHCATHINON	28
XTC/MDMA	MDMA, ECSTASY, EXTASY, ECTASY, XTC, MDMA., ECXTASY, ECSTASY., MDMO, MDM, MDMD, MDMH, MDMP, MOMA, NMDA, MDA, EXTASY., NDMA, MD, EXTACY, EXSTACY, EXT, EXTASIS, EXSTASY, ESCTASY, EXCTASY, EXCSTASY, ECSSTASY, EKSTASY, XTL, MDAM, MDPV, MDHA, MAMA, MOM	35
Methamphetamine	CRYSTAL, METH, METHAMPHETAMIN, CRYSTALMETH, METHAPHETAMINE, METHAMPHETAMINE, METH., METHYLETHCATHINON, CRYSTALL, CHRYSTAL, CHRYSTALMETH, CHRISTALL, CRISTAL, CRISTALMETH, CHRISTAL, METHS, CHRISTALMETH, METHPHETAMINE, CHRISTALMET, METHAPHETEMINE, CHRISTALMETHAPHETAMINE, KRISTAL, METHYL, (METHYLPHENIDAT), METHAMPHETAMINES, METAMPHETAMIN, METAMPHETAMINES, METAMPHETAMINE, TINA, SLAMS, CRYSTEL, CRYSTE, CRYSTALMETHAMPHETAMIN, MET, CRYST., CRYSTALMETHS, CRYSTALMITH, CRYSTALMED, (METHYLAMPHETAMIN), CRYSTAL., CRYSTHAL, (CRYSTAL, METH), METHAPHETAMIN, AMPHET(CRISTAL), <METH, META, ICE, METHAFETAMIN, CRISTEL, METHYLPHENIDATE, METHYLAMPHETAMIN, (METHAMPHETAMIN), METHANPHETAMIN, CHRYTALMETH., METHYLAMPHETAMINE, METHAPHETHAMIN, METHYLAPHETAMIN, METHYLPHENILAT, METHANFHETAMIN, METHEMPHATAMINE, METHAMPHETAMINS, METHA, METHAFETAMINE, METHYLAMPHETAM, THAI, THAIPILLEN, THAIPILL, THAIPILLE, METAPHETAMIN, METAMIN, METAMPHET, METYLAMPHETAMIN, MEET	74
Mephedrone	MEPH, MEPH., 3MMC, MEPHADRON, MEPHEDRON, MEPHODON, MEPHAMPHETAMIN, MEPHETAMIN, MEPHEDRONE, MEPHODRON, MEPHEDEON, MEPHEDREON, MMC, MEF, KATALGIN, KAT, 3MC	17
GHB/GBL	GHB, GBL, GHBS, LIQUID, GHB., GHB;, GBH, GAP, GMBH, GMB, GHS, CABL, GABA, GDL, CHB, GLBK, GJB	17
Ketamine	KETAMINE, KETAMIN, KETALGIN, KETALGINE, KETALAR, KELAMIN, KETAMINES, KETAMINA, KETAMINI, KETAMI, KETALIN, KETALOR, KETANIM, MXE	14
Amyl nitrite	POOPPERS, POPPERS, AMYL., POPPER, POPPERD, POPPERR, POPPES, POPPPERS, AMYLNITRIT, POOPERS, AMYL, AMYLNITRIL, D'AMYLE, POMPERS, POPERS	15
LSD/other psychogenic drugs	LSD, MUSHROOMS, PILZE, TRYPTAMINE, ACIDE, AYAHUASCA, TRYPTAMIN, PILZ, MUSHROOM, PSYLO	10
Benzodiazepine	BENZO'S, BENZO, BENZODIAZEPIN, BENZODIAZEPINES, BENZODIEPINE, BENZODIAZEPINE, (DORMICUM), BENZOS, TEMESTA, SERESTA, DORMICUM, STILNOX, ROHYPNOL, MIDAZOLAM, MIDAZOLON, MIDAZOLAN, RIVATRIL, MIDAZULAM, BENZEDIAZEPINE, BENZODIAZÉPINE, BENZODOAZEPINE, BENZODAIZEPINE, DEMETRIN, (BENZODIAZEPIN), BENZODIAZIPINE, (ROHYPNOL, TEMESTA), BENZONAZEP., BENZODIAZEPINS, BENZODIAZÉPINES, BENZODIA, BENZODIAZEPHINE, VALIUM, BENZIDIAZEPINE, BENZOMORPHINE, XANAX, ROHIPNOL, DIAZEPINE, DIAZEAM, DIAZEPAM, BEZODIAZEPINE, DIAZEPAN, BENTODIAZEPINE, DIAZEPINES, OXAZEPAM, OXAZEPRAM, RIVOTRIL, MIDAZOLEM, BEXIN, ZOLPIDEM, ZOLPIDEN, (ALPRAZOLAM), ZOLDORM, LEXOTANIL, BDZ, MIAZOLAM, BZD, ALPRAZOLAN	58
Cannabis	CANABIS, MARIHUANA, THC, MARIJUANA, MARIJUANNA, HASCHICH, HASCHISCH, JOINT, THB, SHIT, COOKIES	11
Heroin	DIAPHIN, DIAPHON, SUGAR	3
Other opioids	METHADON, METHADONE, KETALGIN, KETALGINE, SUBUTEX, SEVRELONG, OPIUM, MORPHINE, DIAMORPHIN, MORPHIUM, METADON, MST, SOBUTEX, BUPRÉNORPHINE, POLAMIDON, CODEIN, TRAMADOL, TEMGESIC, RESYL, SCHLAFMOHN, OXYCODE, TRAMOL, OXYCODONE, BENZOMORPHINE, KAPANOL	25
Cocaine	COCAÏNE, COCAINE, COKAINE	3
Methylphenidate	RITALIN, RITALINE, (METHYLPHENIDAT), METHYLPHENIDATE, RETALINE, MPH	6
Anabolic steroids	STÉROÏDES, ANABOLICA, ANABOLICUM, ANABOLIC, ANABOLICS, ANABOLIKA, ANABOLISANT, ANABOLISANTS, TESTOSTERONE, DHEA	10
Other prescription drugs	TIZANIDIN, SIRDALUD, TRANQUILIZER, TRANQUILIZERS, AKINETON(SUCHS), REMERON, WETALGIN, AAS, BEXIN, VIAGRA	10
Not assignable	AMONIAK, CHS, PARTYPILLE, INFO SUIVRA, PARTY DRUGS, Herbal Drugs, KETONE, DIFFERENTS PSYCHODRUGS, Ecstay, NO ANSWER, 4mec, RECREATIONALS, RECREATIONAL, PART DRUGS, TRIPPER, DESIGNER DROGE, DESIGNERDROGEN, DESIGNERDROGE, GHL, partydroge, UKNOWN WHAT, DOPAMIN, CBD (CANNABIDOL), UNCLEAR, TENG, RECREATIONAL DRUGS, kc, noctamid, sevre long, ZOLIPDEM, DOESN'T TELL, UNKNOWN, UNKLAR WAS !, ALUMINIUM, PATIENT REFUSES TO ANSWER, DHL, unclear, party dengs, sleeping pills, TRAMAL, SEXUAL RELATED DRUG, SEX ENHANCER, SEXUAL STIMULANTS, MIXTURE IN PILLS, SEXUAL DRUG, ?, CHEMSEX, info suit..., herbal product, unknown, PARTY PILL, MEX, CBD TROPFEN, PARTYDROGEN, 0, COCKTAIL OF ANGS., div. Partydrogen, 9, UNK, avpv, matamphetamin, Seed, Party drugs, STIMLANTS, mona, tile, MBA, KO-TROPFEN, Kethamine, NA, POLYPNOL, DOESNT ANSWER, Tuzlada, NORPLIN, 0, RILZLIN IV, SEX ENHANCER	72
	Total	408

GHB/GBL, γ-hydroxybutric acid/γ-butyrolactone; LSD, lysergic acid diethylamide; XTC/MDMA, 3,4-methylenedioxymethamphetamine.

2. Data quality: way of administration

There are two free text fields in the SHCS follow-up questionnaire, one for intravenous (iv) drugs and one for nonintravenous drugs. In the main analysis, we combined these entries and did not analyse them separately. The following table, however, lists how often a substance was reported as intravenous and how often as nonintravenous.

Drug	Intravenous	Nonintravenous	iv plausible
Amphetamine	18	445	TRUE
XTC/MDMA	15	4684	FALSE
Methamphetamine	468	968	TRUE
Mephedrone	5	24	TRUE
GHB/GBL	4	903	FALSE
Ketamine	127	411	TRUE
Amyl nitrite	1	5085	FALSE
LSD/other psychogenic drugs	1	140	FALSE
Benzodiazepine	92	676	TRUE
Cannabis	2	54	FALSE
Heroin	10	2	TRUE
Other opioids	46	124	TRUE
Cocaine	2	5	TRUE
Methylphenidate	19	35	FALSE
Anabolic steroids	1	22	TRUE
Other prescription drugs	0	13	FALSE

GHB/GBL, γ-hydroxybutric acid/γ-butyrolactone; LSD, lysergic acid diethylamide; XTC/MDMA, 3,4-methylenedioxymethamphetamine.
There were 42 clearly wrongly classified iv entries (see the orange boxes), out of 811 iv entries, i.e. 5.2% (42/811) of all iv classified entries were in the wrong column.