

## Sex work and transactional sex among chemsex users in German-speaking countries

Douglas Dubrovin Leão, Naiiri Khorikian-Ghazari, Theresa Halms, Anna Martina Strasser, Iana Ianovska, Sinan Karcher, Andrea Rabenstein, Tobias Rüter, Alkomiet Hasan, Marcus Gertzen

### Angaben zur Veröffentlichung / Publication details:

Dubrovin Leão, Douglas, Naiiri Khorikian-Ghazari, Theresa Halms, Anna Martina Strasser, Iana Ianovska, Sinan Karcher, Andrea Rabenstein, Tobias Rüter, Alkomiet Hasan, and Marcus Gertzen. 2025. "Sex work and transactional sex among chemsex users in German-speaking countries." *International Journal of Mental Health and Addiction*. <https://doi.org/10.1007/s11469-025-01466-6>.



# Sex Work and Transactional Sex Among Chemsex Users in German-Speaking Countries

Douglas Dubrovin Leão<sup>1</sup> · Naiiri Khorikian-Ghazari<sup>1</sup> · Theresa Halmes<sup>1</sup> · Anna Martina Strasser<sup>1</sup> · Iana Janovska<sup>1</sup> · Sinan Karcher<sup>2</sup> · Andrea Rabenstein<sup>2</sup> · Tobias Rütger<sup>2</sup> · Alkomiet Hasan<sup>1,3</sup> · Marcus Gertzen<sup>1</sup>

Accepted: 25 February 2025  
© The Author(s) 2025

## Abstract

Sex work and transactional sex (SWTS), as well as Chemsex, the intentional use of specific substances aiming to enhance sexual experiences among men who have sex with men (MSM), are associated with high-risk sexual behaviors including unprotected sex and injection drug use and are consequently associated to worse health outcomes, such as higher rates of several sexually transmitted infections (STIs). The main objective of this project was to investigate the prevalence of SWTS among chemsex users and analyze the factors influencing their health outcomes. We conducted an online survey in three European German-speaking countries, and the recruitment took place between March and December 2023 and was performed by convenience sampling, such as placing advertisements and flyering in public places. Eligible participants were MSM aged 18 years old or older who had been sexually active in the past 12 months. There were 399 sexually active MSM included and categorized into three sub-groups: 129 MSM engaging in chemsex (MSM-CX), 128 MSM engaging in sexualized substance use with non-chemsex substances (MSM-SSU), and 142 MSM not engaging in sexualized substance use (MSM-NSU). MSM-CX reported significantly higher rates of SWTS compared to both MSM-SSU ( $p=.032$ ) and MSM-NSU ( $p<.001$ ). Chemsex and SWTS were both individually associated with a higher prevalence of HIV ( $p<.001$  and  $p=.042$ , respectively) and multiple STIs ( $p<.001$  and  $p=.023$ , respectively), MSM-CX engaging in SWTS were younger ( $p=.006$ ), had more sexual partners ( $p=.029$ ), and reported significantly higher rates of use and sexualized use of several substances. However, among MSM-CX, SWTS were not significantly linked to higher rates on HIV ( $p=.702$ ) or multiple STIs ( $p=.380$ ). Our findings have shown that participants involved in chemsex and participants involved in SWTS face overall poorer health outcomes when compared with controls. The results underscore the need for targeted prevention and intervention measures that address these specific needs and risks of MSM-CX and SWTS. There is an urgent need for more representative studies as well as longitudinal studies on chemsex.

**Keywords** Chemsex · Sex work · Transactional sex · Substance use · Addiction · Minority stress

---

Douglas Dubrovin Leão and Naiiri Khorikian-Ghazari shared first authorship.

Extended author information available on the last page of the article

## Abbreviations

<b>MDMA</b>	3,4-methylendioxy-N-methylamphetamine
<b>MSM</b>	Men who have sex with men
<b>MSM-CX</b>	MSM with Sexualized Substance use of chemsex Substances
<b>MSM-SSU</b>	MSM with Sexualized Substance use of non-chemsex Substances
<b>MSM-NSU</b>	MSM who do not engage in Sexualized substance use
<b>GHB</b>	Gamma hydroxybutyrate
<b>GBL</b>	Gamma-butyrolactone
<b>HIV</b>	Human immunodeficiency
<b>IDU</b>	Injection drug use
<b>PrEP</b>	Pre-exposure Prophylaxis
<b>Rx</b>	Prescription
<b>STI</b>	Sexually transmitted infection
<b>SWTS</b>	Sex work and transactional sex

The intentional use of substances immediately before or during sex, specifically to enhance the sexual experience is not a novel phenomenon and is called “sexualized substance use.” Chemsex is defined as the combination of the use of specific substances and sexuality, mainly by men who have sex with men (MSM) and is considered a subtype of sexualized substance use (Bourne et al., 2015; Edmundson et al., 2018; Stuart, 2016). The most common substances in chemsex practices are gamma hydroxybutyrate (GHB), gamma-butyrolactone (GBL), mephedrone, methamphetamine and ketamine (European Centre for Disease Prevention and Control—ECDC, 2019; Schmidt et al., 2016).

Chemsex is strongly associated with high-risk behaviors, especially for physical and mental health, including unprotected sex and injection drug use (IDU) (Edmundson et al., 2018; Maxwell et al., 2019; Sewell et al., 2017). The level of disinhibition during sexual activities associated with chemsex carries significant risks for transmission of several sexually transmitted infections (STIs), notably human immunodeficiency virus (HIV) and hepatitis B and C (Daskalopoulou et al., 2017; Guerra et al., 2020; Pakianathan et al., 2018; Sewell et al., 2017; Tomkins et al., 2019). In addition, there is an increased risk of developing mental health conditions, in particular, addiction disorders, depressive episodes, anxiety disorders, substance-induced psychoses and even suicidal crises (Bohn et al., 2020; Hockenhull et al., 2017; Íncera-Fernández et al., 2021; Maxwell et al., 2019; Strasser et al., 2023; Tomkins et al., 2019). Chemsex-users (MSM-CX) are also vulnerable to experiences of sexual assault and overdoses (Hockenhull et al., 2017). In recent years, there has been a noticeable rise in deaths linked to chemsex, either directly, for example, from overdoses or indirectly, through issues like psychosis or suicidal crises (Batisse et al., 2022).

One particularly high-risk prevalent practice within the chemsex scene is IDU during sexual activities, commonly referred to as “slamming.” This behavior is classified as high-risk due to its strong correlation with numerous severe health outcomes, including addiction, overdoses, acute psychosis, suicidal crisis and the transmission of HIV and other STIs (Dolengevich-Segal et al., 2016; Edmundson et al., 2018; Maxwell et al., 2019; Scheibein et al., 2021; Strasser et al., 2023).

Considering the chemsex phenomenon, the existence of sex work and transactional sex (SWTS) is a relatively unexplored issue. The link between SWTS and other risky behaviors, like frequent substance use, HIV and other STIs, has been well-documented; these negative health outcomes are also prevalent among MSM (Berg et al., 2019). MSM who

practice SWTS also experience a lack of social support, face higher rates of homophobic abuse, and receive disproportionately fewer health treatments (ECDC, 2019).

In this study, we use the term SWTS to acknowledge the nuanced distinction between sex work and transactional sex while recognizing the complexities of self-identity and relationships within these categories. Sex work refers to the consensual exchange of sexual services for money or goods in a commercial context, whereas transactional sex involves “non-commercial, non-marital sexual relationships motivated by the implicit assumption that sex will be exchanged for material support or other benefits.” (Stoebenau et al., 2016). The term transactional sex helps differentiate individuals engaged in these exchanges from sex workers, reducing misrepresentation and unnecessary stigma. Despite their differences, research shows that both are relevant to public health interventions and prevention efforts when in one group and should therefore be analyzed together, especially considering preventions on HIV (McMillan et al., 2018). Since no existing term adequately encompasses both concepts, we use the abbreviation SWTS in this study.

Chemsex experienced a rapid expansion among MSM concurrent with the rise of geo-spatial sexual networking applications, facilitating increased accessibility to both sexual activities and substances (Bourne et al., 2015). The recently documented marked escalation in the prevalence of the chemsex phenomenon underscores its growing importance in public health and the associated public health concerns (Bourne et al., 2015; Kenyon et al., 2018) and poses a risk of considerable and yet undetermined magnitude for MSM community and public health systems. A European study on MSM (EMIS-2017) found that 15% had participated in chemsex, with 69% of them engaging in it within the past 12 months (ECDC, 2019).

This project was initiated to gather a deeper understanding of the dynamics of the chemsex phenomenon and to explore the factors that contribute to the marginalization and increased vulnerability in this population, particularly concerning sexual interactions. Chemsex has its place in the context of syndemics since several factors synergistically contribute to the rise in chemsex participation. These include stigma, marginalization, minority stress, and adverse childhood experiences (Felitti et al., 1998; Meyer, 1995; Pollard et al., 2018). Additionally, the emphasis on body culture and performance within the gay social scene plays a significant role (Knight et al., 2024; Muzi et al., 2023; Yelland & Tiggemann, 2003). These factors are interrelated and negatively impact each other, worsening the course of each aspect. This interaction heightens vulnerability and is further aggravated by existing social challenges this population faces (Singer et al., 2017).

The main objective of this project was to investigate whether chemsex users have higher rates of SWTS and to analyze the impact of chemsex and SWTS and associated syndemic factors on health outcomes of the participants.

## Materials and Methods

### Design and Sample

We conducted an exploratory, anonymous, cross-sectional, and self-administered internet-based survey. The online questionnaire, available in German and English, was created using the SoSci Survey Version 3.5.02 (Leiner, 2019). The study was approved by the ethics committee of the faculty of medicine of the Ludwig-Maximilians-University.

Recruitment took place between March and December 2023 and was performed by convenience sampling. We promoted our study in German-speaking countries (Germany, Austria, and Switzerland). Advertisements were placed in public transport in Munich, Berlin, Hamburg and Cologne. We also made use of online advertisement on Grindr® (a popular dating/casual sex smartphone application among MSM). Flyers were distributed at events frequented by MSM and we utilized cooperative networks such as clinics and counseling centers (see collaborators list in the supplement section). Our advertisements had a QR code with a link to a dedicated website that provided information about the study and access to the questionnaire.

Eligible participants were MSM aged 18 years old or older who had been sexually active in the past 12 months. We defined MSM for all analyses as participants who identified as cis-male (assigned male at birth and identifying as male) and reported being attracted to other cis-male individuals, whether exclusively or not.

## Measures

A structured, standardized questionnaire was developed to assess sociodemographic factors, substance use, sexualized substance use, sexual risk behaviors, SWTS practices, and health outcomes (The questionnaire will be made available upon request).

**Sociodemographics** Participants' gender identity was assessed using the options female-cis, female-trans, male-cis, male-trans, diverse and not listed. Regarding sexual orientation, participants were able to give multiple answers depending on which gender they felt sexually attracted to, using the same categories as the gender definition. MSM who were exclusively sexually attracted to male-cis were classified as homosexual. The educational level was assessed using 12 categories corresponding to possible educational levels in Germany, Austria and Switzerland and then the levels were dichotomized. Higher educational levels, such as technical college or university degree, Bachelor, Master or Magister and PhD, were condensed into "university education" and the remaining into "no university education." Relationship status was assessed through the options single, monogamous, open relationship, polyamorous/polygamous, and not listed. Afterward, it was dichotomized as "single" versus "in a relationship".

**Substance use** Participants indicated their use of 21 specific substances in the past 12 months on a 6-level frequency scale ranging from never to daily. To facilitate identification and differentiation, some substances were also referred to by other commonly used or street names (e.g., Poppers for amyl nitrite, Tina for methamphetamine, Kate for ketamine). Our survey did not differentiate GHB from GBL; we focused on understanding the use of these substances as a whole, as they have similar effects and the body converts GBL into GHB (Giorgetti et al., 2017).

**Sexualized substance use and chemsex** Participants who indicated the use of at least one substance were then asked about their use in sexual contexts in the past 12 months on a 6-level frequency scale ranging from never to daily. Methamphetamine, GHB/GBL, mephedrone and ketamine were categorized as chemsex substances.

**Subgroups** We categorized our population into three sub-groups according to substance use patterns: MSM with sexualized substance use of chemsex substances (MSM-CX), MSM with sexualized substance use of non-chemsex substances (MSM-SSU) and MSM who do not engage in sexualized substance use (MSM-NSU). The use of sexual enhancers such as sildenafil, tadalafil, vardenafil, and avanafil was also registered but did not influence the group distribution since they have no direct psychoactive effect.

**SWTS** Participants who affirmed the statement, “I have received money, gifts, substances, or any kind of reward for sexual acts,” were classified as SWTS. SWTS participants were further asked if they had received rewards within the past 12 months. Participants who indicated receiving rewards at least once within the past 12 months were considered recent SWTS. SWTS who negated the statement “I would describe myself as a sex worker or person in prostitution” were classified as transactional sex practitioners; the other participants were consequently classified as sex workers.

**Sexual risk behaviors and health outcomes** Risk behaviors assessed included the number of sexual partners, attending group sex or sex parties and condom use frequency. Sexual health outcomes assessed included recent history of STI and HIV status. Participants could choose not to disclose their HIV status. We further asked HIV-negative participants about their use of Pre-exposure Prophylaxis (PrEP) and HIV-positive participants about their antiretroviral therapy. Participants were asked whether they had ever received psychological or psychiatric treatment and if they had consulted a doctor in the past 12 months due to STIs.

**Data integrity** To ensure data reliability, participants were first asked at the beginning of the questionnaire if they had previously participated and, at the end, whether they had responded in a trustworthy manner.

## Statistical Analysis

The data were analyzed using IBM SPSS statistics version 29 (IBM Corp., 2023). Unanswered questions, including those from dropouts, were coded as system missing. Each analysis was conducted using the available data, leading to varying sample sizes throughout the analyses. Initially, descriptive statistics were calculated to provide absolute and relative frequencies, means and standard deviations.

For the metric variables age and number of sexual partners, the non-parametric Kruskal–Wallis test was applied due to the non-normal distribution of the sample. For the post hoc analysis of the number of sexual partners, to compare the three subgroups, a Games-Howell test was conducted considering the variance heterogeneity. To evaluate the correlation between substance use frequency and participation in SWTS Spearman’s test was used. Chi-square tests were used for frequency analyses and were conducted only when each cell of the contingency table had an expected frequency of at least five, in accordance with the test’s assumptions. When this assumption wasn’t met for two-group comparisons, we opted for Fisher’s exact test as an alternative. A significance level of  $p < 0.05$  was applied for the overall tests. For the 2 post-hoc pairwise comparisons (MSM-CX vs. MSM-SSU and MSM-CX vs. MSM-NSU), a Šidák-corrected significance level of  $p < 0.025$  was used.

## Results

During the study, 1,337 datasets were collected. Records with invalid or missing information on age, gender and sexual activity were excluded, as well as those from participants who admitted to having given inaccurate responses or had already participated. Of the remaining 1,236 datasets, 463 participants identified as MSM. Participants who reported no sexual activity, or reported substance use or sexualized substance use without specifying the substances were also excluded. The final analysis included 399 participants, with participants showing a mean age of 38.2 ( $SD = 11.6$ ).

The demographic characteristics of the sample population are summarized in Table 1, where the participants were divided into 3 subgroups; 129 participants (32.3%) indicated the sexualized use of the chemsex substances and were classified as MSM-CX; 128 participants (32.1%) indicated sexualized use of other substances and were classified as MSM-SSU; 142 participants (35.6%) did not use substances in sexual contexts and were classified as MSM-NSU. All three groups showed no differences in age ( $p = 0.353$ ), language ( $p = 0.086$ ), educational levels ( $p = 0.440$ ), and sexual orientation ( $p = 0.390$ ). MSM-CX were significantly more likely to be single than both MSM-SSU ( $p = 0.002$ ) and MSM-NSU ( $p = 0.010$ ).

### Sex Work and Transactional Sex

The participants reported an overall prevalence of 16.9% having ever received rewards for sexual contact and 10.5% doing so within the past 12 months as shown in Table 2. MSM-CX showed a non-significant trend toward a higher likelihood of SWTS compared to MSM-SSU ( $p = 0.064$ ) and significantly higher rates compared to MSM-NSU ( $p < 0.001$ ). They also reported significantly higher rates of recent SWTS compared to both MSM-SSU ( $p < 0.001$ ) and MSM-NSU ( $p < 0.001$ ).

Among participants who engaged in SWTS, 83.3% did not identify as sex workers and were therefore classified as transactional sex practitioners, 3.0% provided no answer, and the remaining 13.6% were conversely classified as sex workers. All participants stated that the rewards they received from SWTS were not their primary source of income.

Table 3 shows the sociodemographic data according to SWTS engagement, with SWTS participants presenting significantly younger age ( $M = 34.7$ ,  $SD = 9.5$ ) than controls ( $M = 39.0$ ,  $SD = 11.9$ ,  $p = 0.012$ ) as well as significantly lower educational levels ( $p = 0.036$ ).

Among MSM-CX, participants engaging in SWTS showed also significantly younger age ( $M = 34.8$  years old,  $SD = 10.1$ ) than MSM-CX not involved in SWTS ( $M = 40.7$ ,  $SD = 11.1$ ,  $p = 0.009$ ). We observed a trend in lower educational levels among MSM-CX who engaged in SWTS, though it was not significant ( $p = 0.094$ ).

### Substance Use

The most commonly used substances in our sample over the past 12 months were alcohol (84.0%), poppers (58.9%) and tobacco (56.4%), followed by cannabis (47.6%). Among all participants, 16.0% reported IDU. Among those who engaged in IDU, 89.1% were MSM-CX. MSM-CX indicated a significantly higher prevalence of use of

**Table 1** Sociodemographics

	Full Sample		MSM-CX		MSM-SSU		MSM-NSU		Overall		MSM-CX vs. MSM-SSU		MSM-CX vs. MSM-NSU	
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>H/<math>\chi^2</math>(df)</i>	<i>P</i>	$\chi^2$ (df)	<i>P</i>	$\chi^2$ (df)	<i>P</i>
Age - <i>M</i> ( <i>SD</i> )	38.2 (11.6)		38.9 (11.1)		38.5 (11.6)		37.1 (12.0)		2.08 (2) <sup>a</sup>	.353				
Language														
German	366	91.7%	115	89.2%	124	96.9%	127	89.4%	6.58(2)	.086				
English	33	8.3%	14	10.8%	4	3.1%	15	10.6%						
Homosexual														
Yes	265	66.4%	89	69.0%	79	61.7%	97	68.3%	1.88(2)	.390				
No	134	43.6%	40	31.0%	49	38.3%	45	31.7%						
Relationship status														
Single	149	43.2%	65	56.0%	41	35.3%	43	38.1%	11.92(2)	.002**	9.19(1)	.002*	6.72(1)	.010*
In a relationship	196	56.8%	51	44.0%	75	64.7%	70	61.9%						
Education level														
University education	192	55.0%	60	51.7%	69	60.0%	63	55.3%	1.61(2)	.446				
No university education	153	44.1%	56	48.3%	46	40.0%	51	44.7%						

Sociodemographics of all participants (*n*=399) and subgroups. MSM-CX, MSM-SSU, and MSM-NSU are independent subgroups based on substance use behavior in the past 12 months. The term homosexual refers to MSM exclusively attracted to the cis-male gender. Significance Levels for overall analysis *p* < 0.05 (\*), *p* < 0.01 (\*\*), *p* < 0.001 (\*\*\*). Post hoc pairwise comparisons were performed when the overall analysis was significant. Significance level for post-hoc analysis *p*<.025(\*), *p*<.01(\*\*), *p*<.001(\*\*\*). a Kruskal-Wallis test

**Table 2** Sex work and transactional sex among MSM according to sexualised substance use patterns

	Full Sample		MSM-CX		MSM-SSU		MSM-NSU		Overall		MSM-CX vs. MSM-SSU		MSM-CX vs. MSM-NSU	
	<i>(n = 391)</i>		<i>(n = 126)</i>		<i>(n = 127)</i>		<i>(n = 138)</i>		$\chi^2$ (df)	<i>p</i>	$\chi^2$ (df)	<i>p</i>	$\chi^2$ (df)	<i>p</i>
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%						
SWTS														
Ever	66	16.9%	34	27.0%	22	17.3%	10	7.3%	18.31(2)	<.001***	3.43(1)	.064	18.48(1)	<.001***
Rewards														
Money	47	12.0%	22	17.5%	18	14.2%	7	5.1%	10.38(2)	.006**	1.92(1)	.166	0.10(1)	.756
Substances	30	7.7%	23	18.3%	7	5.5%	0	0.0%	-	-	-	-	-	-
Gifts	20	5.1%	8	6.3%	7	5.5%	5	3.6%	-	-	-	-	-	-
Housing	19	4.9%	11	8.7%	5	3.9%	4	2.9%	-	-	-	-	-	-
Not listed	3	0.8%	3	2.4%	0	0.0%	0	0.0%	-	-	-	-	-	-
Recent	42	10.7%	28	22.2%	9	7.1%	5	3.6%	18.31(2)	<.001***	11.60(1)	.001**	13.47(1)	<.001***
Rewards														
Money	23	5.9%	12	9.5%	6	4.7%	5	3.6%	4.60(2)	.100	1.55(1)	.214	5.55(1)	.019*
Substances	26	6.6%	21	16.7%	5	3.9%	0	0.0%	-	-	-	-	-	-
Gifts	12	3.1%	6	4.8%	3	2.4%	3	2.2%	-	-	-	-	-	-
Housing	14	3.6%	9	7.1%	3	2.4%	2	1.5%	-	-	-	-	-	-
Not listed	2	0.5%	2	1.6%	0	0.0%	0	0.0%	-	-	-	-	-	-
Self-definition SWTS														
Sex work	9	2.3%	5	4.0%	3	2.4%	1	0.7%	-	-	-	-	-	-
Transactional sex	55	14.1%	29	23.0%	18	14.2%	8	5.8%	-	-	-	-	-	-
No answer	2	0.5%	0	0.0%	1	0.8%	1	0.7%	-	-	-	-	-	-

Prevalence of sex work and transactional sex among all participants (*n*=391) and subgroups over the past 12 months. MSM-CX, MSM-SSU, and MSM-NSU are independent subgroups based on substance use behavior in the past 12 months. Chi-square tests were used for frequency analyses and were conducted only when each cell of the contingency table had an expected frequency of at least five. Significance levels: *p* < 0.05(\*), *p* < 0.01(\*\*), *p* < 0.001(\*\*\*). Post hoc pairwise comparisons were performed when the overall analysis was significant. Significance level for post hoc analysis *p* < 0.025(\*), *p* < 0.01(\*\*), *p* < 0.001(\*\*\*). "Recent" refers to behavior within the past 12 months. a "No answer" was not considered

**Table 3** Sociodemographics among MSM according to engagement in SWTS

	Full Sample				MSM-CX				MSM-CX			
	SWTS		No-SWTS		SWTS		No-SWTS		Full Sample		MSM-CX	
	n	%	n	%	n	%	n	%	H/ X <sup>2</sup> (df)	p	H/ X <sup>2</sup> (df)	p
Age - <i>M</i> ( <i>SD</i> )	34.7	(9.5)	39.0	(11.9)	34.8	(10.1)	40.7	(11.1)	6.36(1) <sup>a</sup>	.012*	6.85(1) <sup>a</sup>	.009*
Language												
German	61	92.4%	297	91.4%	30	88.2%	82	89.1%	0.00(1)	.973	0.02(1)	.887
English	5	7.6%	28	8.6%	4	11.8%	10	10.9%				
Homosexual												
Yes	41	62.1%	218	67.1%	22	64.7%	64	69.6%	0.40(1)	.526	0.27(1)	.603
No	25	37.9%	107	32.9%	12	35.3%	28	30.4%				
Relationship status												
Single	27	43.5%	122	44.0%	22	66.7%	43	51.8%	0.00(1)	.943	2.12(1)	.146
In a relationship	35	56.5%	155	56.0%	11	33.3%	40	48.2%				
Education level												
University education	27	43.5%	164	58.2%	13	39.4%	47	56.6%	4.39(1)	.036*	2.81(1)	.094
no university education	35	56.5%	118	41.8%	20	60.6%	36	43.4%				

Relative data on demographic characteristics among all participants according to engagement in SWTS over the past 12 months (*n*=391) and among the subgroup MSM-CX (*n*=126). The term homosexual refers to MSM exclusively attracted to the cis-male gender. Significance Levels: *p*<0.05(\*), *p*<0.01(\*\*), *p*<0.001(\*\*\*). Post hoc pairwise comparisons were performed when the overall analysis was significant. Significance level for post hoc analysis *p*<0.25(\*), *p*<0.01(\*\*), *p*<0.001(\*\*\*). a Kruskal-Wallis test

**Table 4** Substance use prevalence

Substance use	Full Sample		MSM-CX		MSM-SSU		MSM-NSU		Overall		MSM-CX vs. MSM-SSU		MSM-CX vs. MSM-NSU	
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	$\chi^2$	<i>p</i>	$\chi^2$	<i>p</i>	$\chi^2$	<i>p</i>
Alcohol	335	84.0%	117	90.7%	124	96.9%	94	66.2%	53.47(2)	<.001***	3.21(1)	.073	23.54(1)	<.001***
Tobacco	225	56.4%	88	68.2%	71	55.5%	66	46.5%	13.05(2)	.001***	3.90(1)	.048	13.02(1)	<.001***
Poppers	235	58.9%	111	86.0%	85	66.4%	39	27.5%	100.21(2)	<.001***	12.63(1)	<.001***	93.86(1)	<.001***
Cannabis	190	47.6%	78	60.5%	71	55.5%	41	28.9%	31.70(2)	<.001***	0.47(1)	.493	27.39(1)	<.001***
Methamphetamine	76	19.0%	68	52.7%	1	0.8%	7	4.9%	140.87(2)	<.001***	85.60(1)	<.001***	77.11(1)	<.001***
Ketamine	102	25.6%	78	60.5%	9	7.0%	15	10.6%	122.47(2)	<.001***	79.55(1)	<.001***	74.68(1)	<.001***
GHB/GBL	107	26.8%	98	76.0%	1	0.8%	8	5.6%	235.48(2)	<.001***	150.21(1)	<.001***	140.41(1)	<.001***
Mephedrone	97	24.3%	84	65.1%	4	3.1%	9	6.3%	172.88(2)	<.001***	106.92(1)	<.001***	103.60(1)	<.001***
Cocaine	132	33.1%	80	62.0%	31	24.2%	21	14.8%	74.79(2)	<.001***	35.88(1)	<.001***	64.48(1)	<.001***
Crack	9	2.3%	6	4.7%	1	0.8%	2	1.4%	-	-	-	-	-	-
Amphetamine	121	30.3%	87	67.4%	17	13.3%	17	12.0%	124.35(2)	<.001***	76.00(1)	<.001***	87.95(1)	<.001***
MDMA	116	29.1%	80	62.0%	19	14.8%	17	12.0%	100.60(2)	<.001***	58.39(1)	<.001***	73.66(1)	<.001***
Ecstasy	122	30.6%	79	61.2%	25	19.5%	18	12.7%	85.93(2)	<.001***	44.68(1)	<.001***	69.37(1)	<.001***
Benzodiazepine	42	10.5%	27	20.9%	6	4.7%	9	6.3%	22.10(2)	<.001***	15.15(1)	<.001***	12.49(1)	<.001***
Opioids	22	5.5%	8	6.2%	7	5.5%	7	4.9%	.021(2)	.900	0.06(1)	.802	0.21(1)	.647
Other inhalants	38	9.5%	24	18.6%	9	7.0%	5	3.5%	19.21(2)	<.001***	7.69(1)	.006**	16.09(1)	<.001***
Hallucinogens	79	19.8%	39	30.2%	22	17.2%	18	12.7%	13.93(2)	<.001***	5.34(1)	.021	12.54(1)	<.001***
Synthetic Cannabinoids	16	4.0%	6	4.7%	6	4.7%	4	2.8%	082(2)	.665	0.19(1)	.989	0.64(1)	.424
Painkillers with Rx	87	21.8%	28	21.7%	28	21.9%	31	21.8%	0.00(2)	.999	0.00(1)	1.000	0.00(1)	.980
Painkillers without Rx	88	22.1%	27	20.9%	27	21.1%	34	23.9%	0.46(2)	.795	0.00(1)	1.000	0.35(1)	.553
Substitute with Rx	4	1.0%	2	1.6%	0	0.0%	2	1.4%	-	-	-	-	-	-
Substitute without Rx	1	0.3%	1	0.8%	0	0.0%	0	0.0%	-	-	-	-	-	-

**Table 4** (continued)

	Full Sample		MSM-CX		MSM-SSU		MSM-NSU		Overall		MSM-CX vs. MSM-SSU		MSM-CX vs. MSM-NSU	
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	$\chi^2$	<i>p</i>	$\chi^2$	<i>p</i>	$\chi^2$	<i>p</i>
Others with Rx	41	10.3%	20	15.5%	15	11.7%	6	4.2%	9.75(2)	.008**	0.78(1)	.376	9.91(1)	.002**
Others without Rx	17	4.3%	11	8.5%	2	1.6%	4	2.8%	8.77(2)	.012**	6.49(1)	.011**	4.22(1)	.040
Intravenous use	64	16.0%	57	44.2%	3	2.3%	4	2.8%	112.15(2)	<.001***	60.54(1)	<.001***	66.32(1)	<.001***
Use of Sexual enhancers <sup>a</sup>	186	46.6%	105	81.4%	55	43.0%	26	18.3%	109.11(2)	<.001***	38.76(1)	<.001***	107.72(1)	<.001***

Prevalence of substance use and their sexualized use among all participants (*n*=399) and subgroups over the past 12 months. MSM-CX, MSM-SSU, and MSM-NSU are independent subgroups based on substance use behavior in the past 12 months. Chi-square tests were used for frequency analyses and were conducted only when each cell of the contingency table had an expected frequency of at least five. Significance levels: *p*<0.05(\*), *p*<0.01(\*\*), *p*<0.001(\*\*\*) Post hoc pairwise comparisons were performed when the overall analysis was significant. Significance level for post hoc analysis *p*<.025(\*), *p*<0.01(\*\*), *p*<0.001(\*\*\*) a Sexual enhancers assessed include sildenafil, tadalafil, vardenafil and avanafil

**Table 5** Sexualized substance use prevalence

	Full Sample ( <i>n</i> = 257)		MSM-CX ( <i>n</i> = 129)		MSM-SSU ( <i>n</i> = 128)		MSM-CX vs. MSM-SSU	
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	OR/ $\chi^2$ ( <i>df</i> )	<i>p</i>
Sexualized substance use								
Alcohol	158	61.5%	71	55.0%	87	68.0%	4.54(1)	.033*
Tobacco	77	30.0%	43	33.3%	34	26.6%	1.40(1)	.236
Poppers	193	75.1%	110	85.3%	83	64.8%	14.34(1)	<.001***
Cannabis	112	43.6%	62	48.1%	50	39.1%	2.12(1)	.146
Methamphetamine	67	26.1%	67	51.9%	-			
Ketamine	64	24.9%	64	49.6%	-			
GHB/GBL	97	37.7%	97	75.2%	-			
Mephedrone	82	31.9%	82	63.6%	-			
Cocaine	88	34.2%	64	49.6%	24	18.8%	27.18(1)	<.001***
Crack	3	1.2%	3	2.3%	0	0.0%	-	
Amphetamine	75	29.2%	66	51.2%	9	7.0%	60.55(1)	<.001***
MDMA	74	28.8%	59	45.7%	15	11.7%	36.26(1)	<.001***
Ecstasy	82	31.9%	63	48.8%	19	14.8%	34.17(1)	<.001***
Benzodiazepine	10	3.9%	9	7.0%	1	0.8%	9.53	.019*
Opioids	7	2.7%	2	1.6%	5	3.9%	0.39	.281
Other inhalants	19	7.4%	16	12.4%	3	2.3%	5.90	.003**
Hallucinogens	27	10.5%	18	14.0%	9	7.0%	2.14	.102
Synthetic Cannabinoids	6	2.3%	3	2.3%	3	2.3%	0.99	1.000
Painkillers with Rx	14	5.5%	9	7.0%	5	3.9%	1.85	.411
Painkillers without Rx	11	4.3%	7	5.4%	4	3.1%	1.78	.540
Substitute with Rx	2	0.8%	2	1.6%	0	0.0%	-	
Substitute without Rx	0	0.0%	0	0.0%	0	0.0%	-	
Others with Rx	12	4.7%	6	4.7%	6	4.7%	0.99	1.000
Others without Rx	2	0.8%	2	1.6%	0	0.0%	-	
Sexualized Intra-venous use	46	17.9%	45	34.9%	1	0.1%	68.04	<.001***

Prevalence of sexualized substance use among subgroups MSM -CX and MSM -SSU over the past 12 months. MSM -CX and MSM -SSU are independent subgroups based on substance use behavior in the past 12 months. Chi -square tests were used for frequency analyses and were conducted only when each cell of the contingency table had an expected frequency of at least five. Fisher 's exact test was performed when the sample did not meet the assumptions for the chi -square test. Significance levels:  $p < 0.05$ (\*),  $p < 0.01$ (\*\*),  $p < 0.001$ (\*\*\*). 1 Sexual enhancers assessed include sildenafil, tadalafil, vardenafil and avanafil

several substances compared to MSM-SSU and MSM-NSU and a significantly higher prevalence of sexualized use of several substances compared to MSM-SSU as shown in Tables 4 and 5.

Tables 6 and 7 show the correlations between SWTS engagement and the frequency of substance use, highlighting a significantly higher frequency of substance use, IDU and sexualized substance use across various substances among participants who engaged in SWTS compared to the correspondent control group, especially among the subgroup MSM-CX.

**Table 6** Spearman correlations between substance use frequency and SWTS among MSM and the subgroup MSM-CX

	Full Sample			MSM-CX		
	<i>n</i>	<i>Spearman's rho</i>	<i>p</i>	<i>n</i>	<i>Spearman's rho</i>	<i>p</i>
Substance use						
Alcohol	358	.051	.340	126	.165	.065
Tobacco	358	.042	.430	126	.099	.270
Poppers	358	.191	<.001***	126	.201	.024*
Cannabis	358	.214	<.001***	126	.254	.004**
Methamphetamine	357	.158	.003**	126	.186	.037*
Ketamine	357	.078	.142	126	.021	.817
GHB/GBL	357	.128	.015*	126	.096	.286
Mephedrone	357	.110	.037*	126	.042	.640
Cocaine	358	.096	.069	126	.058	.516
Amphetamine	358	.071	.181	126	.021	.818
MDMA	358	.100	.059	126	.080	.376
Ecstasy	358	.082	.120	126	.082	.360
Hallucinogens	357	.113	.033*	126	.051	.573
Painkillers with Rx	358	.139	.009**	126	.220	.013*
Painkillers without Rx	358	.099	.060	126	.118	.189
Sexual enhancers <sup>a</sup>	358	.043	.422	126	-.041	.652
Intravenous use	358	.125	.018*	126	.068	.450

Spearman correlations between substance use frequency over the past 12 months among MSM ( $n=356$ ) and subgroup MSM-CX ( $n=126$ ). MSM-CX is a subgroup of MSM. Only substances with an overall use of >50 participants are displayed. Significance Levels:  $p<.05$  (\*).  $p<.01$  (\*\*).  $p<.001$  (\*\*\*). <sup>a</sup> Sexual enhancers assessed include sildenafil, tadalafil, vardenafil, and avanafil

## Sexual Risk Behaviors

Overall, the participants reported having an average number of 35.1 sexual partners in the past year ( $SD=74.0$ ). As presented in Table 8, MSM-CX reported significantly more sexual partners than MSM-SSU ( $p=0.005$ ) and MSM-NSU ( $p<0.001$ ). They were also more likely than both control groups to engage in group sex (vs. MSM-SSU,  $p=0.005$ ; vs. MSM-NSU,  $p<0.001$ ) and to attend private sex parties (both  $p<0.001$ ). Additionally, MSM-CX had significantly lower rates of consistent condom use compared to both control groups (both  $p<0.001$ ).

As shown in Table 9, participants who engaged in SWTS reported a significantly higher average number of sexual partners ( $p<0.001$ ), were more likely to participate in group sex ( $p<0.001$ ) and attend private sex parties ( $p<0.001$ ) than those who did not engage in SWTS. Among SWTS participants, there was no significant difference in the rate of regular condom use ( $p=0.102$ ) and among HIV-negative SWTS participants, there was no significant difference in the rate of PrEP use ( $p=0.066$ ).

MSM-CX participants, who engaged in SWTS reported a significantly higher average number of sexual partners than MSM-CX no-SWTS ( $p=0.047$ ), although there was no significant difference in other sexual risk behaviors between these two groups, such

**Table 7** Spearman correlations between sexualised substance use frequency and SWTS among MSM and the subgroup MSM-CX

	Full Sample			MSM-CX		
	<i>n</i>	<i>Spearman's Rho</i>	<i>p</i>	<i>n</i>	<i>Spearman's Rho</i>	<i>p</i>
Sexualised Substance use						
Alcohol	237	.065	.322	114	.145	.123
Tobacco	157	.171	.033*	86	.156	.152
Poppers	192	.159	.028*	108	.207	.032*
Cannabis	145	.156	.061	75	.218	.060
Methamphetamine	66	.165	.185	65	.151	.229
Ketamine	84	.166	.13	75	.190	.102
GHB/GBL	96	.243	.017*	95	.236	.021*
Mephedrone	88	.246	.021*	84	.266	.014*
Cocaine	109	.303	.001**	78	.285	.011*
Amphetamine	101	.352	<.001***	84	.404	<.001***
MDMA	96	.258	.011*	77	.349	.002**
Ecstasy	101	.170	.090	76	.238	.039*
Hallucinogens	61	.199	.124	39	.037	.824
Painkillers with Rx	55	-.121	.377	27	-.097	.629
Painkillers without Rx	54	-.117	.401	27	-.077	.702
Intravenous use	63	.007	.957	56	.034	.805

Spearman correlations between sexualized substance use frequency over the past 12 months among MSM ( $n=356$ ) and subgroup MSM-CX ( $n=126$ ). MSM-CX is a subgroup of the full sample. Only substances with an overall use of >50 participants are displayed. Significance Levels:  $p<.05$  (\*).  $p<.01$  (\*\*).  $p<.001$  (\*\*\*)

as engaging in group sex ( $p=0.230$ ), attending private sex parties ( $p=0.364$ ), and regular condom use ( $p=0.844$ ).

## Sexual and Mental Health Outcomes

Of our sample, 35.4% reported having at least one STI in the past 12 months and 19.4% reported being HIV positive. Of those with HIV, 30 individuals reported no additional STI in the past year. All HIV-positive participants in our study reported regular intake of antiretroviral therapy.

MSM-CX showed significantly higher frequencies of multiple STIs ( $p<0.001$ ), being HIV positive ( $p<0.001$ ) and having medical consultations because of STIs compared to both MSM-SSU and MSM-NSU. The consistent use of PrEP among seronegative participants was significantly higher among MSM-CX compared to both control groups ( $p<0.001$ ). MSM-CX had a significantly higher rate of receiving psychological or psychiatric treatment (61.5%) compared to MSM-SSU (46.6%,  $p=0.022$ ) and MSM-NSU (40.9%,  $p=0.002$ ).

Among SWTS participants, significantly higher rates of multiple STIs ( $p=0.023$ ) and being HIV positive ( $p=0.042$ ) were observed, but no significantly higher rate of medical consultations because of STIs ( $p=0.303$ ) or higher rates of receiving psychological or psychiatric treatment than no-SWTS participants ( $p=0.640$ ).

**Table 8** Sexual health among MSM according to sexualized substance use patterns

Full sample	MSM-CX		MSM-SSU		MSM-NSU		Overall	MSM-CX vs. MSM-SSU		MSM-CX vs. MSM-NSU			
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%		<i>H</i> / <i>X</i> <sup>2</sup> ( <i>df</i> )	<i>p</i>	<i>MD</i> / <i>X</i> <sup>2</sup> ( <i>df</i> )	<i>p</i>	<i>MD</i> / <i>X</i> <sup>2</sup> ( <i>df</i> )	
Recent sexual partners <i>M</i> ( <i>SD</i> )	35.1	(74.0)	62.6	(98.3)	28.0	(81.2)	14.7	(26.8)	59.90(2) <sup>a</sup>	<.001***	34.6 <sup>b</sup>	47.9 <sup>b</sup>	<.001***
Condom use	( <i>n</i> = 356)		( <i>n</i> = 119)		( <i>n</i> = 120)		( <i>n</i> = 117)						
Never	107	30.1%	58	48.7%	25	20.8%	24	20.5%	29.68(2) <sup>c</sup>	<.001***	19.31(1) <sup>c</sup>	20.70(1) <sup>c</sup>	<.001***
Rarely	56	15.7%	25	21.0%	17	14.2%	14	12.0%					
Some-times	42	11.8%	14	11.8%	14	11.7%	14	12.0%					
Often	77	21.6%	15	12.6%	30	25.0%	32	27.4%					
Always	74	20.8%	7	5.9%	34	28.3%	33	28.2%	24.12(2) <sup>d</sup>	<.001***	16.19(1) <sup>d</sup>	19.33(1) <sup>d</sup>	<.001***
Group sex	228	64.0%	99	83.2%	77	64.2%	52	44.4%	38.47(2)	<.001***	7.959(1)	34.41(1)	<.001***
Private sex par-ties	127	35.7%	82	68.9%	25	20.8%	20	17.1%	86.39(2)	<.001***	54.74(1)	63.39(1)	<.001***
STI													
No	221	62.1%	49	41.2%	86	71.7%	86	73.5%					
Yes	126	34.6%	66	55.5%	31	25.8%	29	24.8%	25.65(2)	<.001***	20.54(1)	13.67(1)	<.001***
One	77	21.6%	35	29.4%	21	17.5%	21	17.9%					
More than one	49	13.8%	31	26.1%	10	8.3%	8	6.8%	32.60(2) <sup>e</sup>	<.001***	18.05(1) <sup>e</sup>	21.02(1) <sup>e</sup>	<.001***
STI													
Don't know	9	2.5%	4	3.4%	3	2.5%	2	1.7%					
HIV positive	69	19.4%	50	42.0%	11	9.2%	8	6.8%	58.82(2)	<.001***	33.92(1)	39.39(1)	<.001***

**Table 8** (continued)

Full sample	MSM-CX		MSM-SSU		MSM-NSU		Overall	MSM-CX vs. MSM-SSU		MSM-CX vs. MSM-NSU				
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%		<i>H</i> / <i>X</i> <sup>2</sup> ( <i>df</i> )	<i>p</i>	<i>MD</i> / <i>X</i> <sup>2</sup> ( <i>df</i> )	<i>p</i>	<i>MD</i> / <i>X</i> <sup>2</sup> ( <i>df</i> )		
Medical consultation	141	39.6%	70	58.8%	33	27.5%	38	35.5%	28.2(2)	<.001***	23.9(1)	<.001***	16.50(1)	<.001***
Psychological or psychiatric treatment	( <i>n</i> = 350)		( <i>n</i> = 117)		( <i>n</i> = 118)		( <i>n</i> = 115)							
PREP use	174	49.7%	72	61.54%	55	46.6%	47	40.9%	10.6(2)	.005*	5.27(1)	.022*	9.917(1)	.002***
Never	( <i>n</i> = 286)		( <i>n</i> = 69)		( <i>n</i> = 109)		( <i>n</i> = 108)							
Rarely	177	61.9%	23	33.3%	73	67.0%	81	75.0%	32.92(2) <sup>c</sup>	<.001***	19.28(1) <sup>c</sup>	<.001***	30.16(1) <sup>c</sup>	<.001***
Some-times	5	1.8%	1	1.5%	3	2.8%	1	0.9%						
Often	8	2.8%	4	5.8%	3	2.8%	1	0.9%						
Always	17	5.9%	8	11.6%	6	5.5%	3	2.8%						
	79	27.6%	33	47.8%	24	22.0%	22	20.4%	18.64(2) <sup>d</sup>	<.001***	12.93(1) <sup>d</sup>	<.001***	14.82(1) <sup>d</sup>	<.001***

Characteristics of sexual health and sexual risk behaviors among participants (*n*=364) and subgroups over the past 12 months. MSM-CX, MSM-SSU, and MSM-NSU are independent subgroups based on substance use behavior in the past 12 months. Chi-square tests were performed for frequency analyses. Significance levels: *p*<.05(\*), *p*<.01(\*\*), *p*<.001(\*\*\*). Post hoc pairwise comparisons were performed when the overall analysis was significant. Significance level for post hoc analysis *p*<.025(\*), *p*<.01(\*\*), *p*<.001(\*\*\*). PREP use refers to participants who have indicated being HIV-negative (*n*=286). a Kruskal-Wallis test. b Games Howell Mean Difference. c For this Chi-square test, the groups were condensed into “never” and “not never.” d For this Chi-square test, the groups were condensed into “always” and “not always.” e For this Chi-square test, the groups considered were “More than one” and “No”

MSM-CX who engaged in SWTS reported no significant differences in health outcomes, such as having had multiple STIs ( $p=0.380$ ), being HIV positive ( $p=0.702$ ) and no significant difference in the rate of medical consultation because of STIs ( $p=1.000$ ) and in the rate of having ever received a psychological or psychiatric treatment ( $p=0.897$ ).

## Discussion

Our study reveals a significant correlation between chemsex and SWTS, both also being correlated with the frequency of substance use and sexualized substance use. Our findings have shown that participants involved in chemsex and participants involved in SWTS face overall poorer health outcomes when compared with controls. These behaviors are closely linked and both are associated with higher-risk behaviors and negative health impacts. However, among chemsex users, the involvement in SWTS have not significantly worsen health outcomes.

Our findings reveal a high prevalence of lifetime and recent involvement in SWTS among MSM, with MSM-CX making up more than half of those who have ever received rewards for sexual contact and two-thirds of those who have done so recently, indicating a strong link between chemsex and SWTS. Our study identified a rate of recent engagement in SWTS among MSM that is double that reported in the EMIS-2010 survey, likely due to a higher prevalence of substance use and a greater representation of chemsex users (ECDC, 2013).

It is well known that clients are often willing to pay more for risky sexual behaviors such as condomless intercourse (Oldenburg et al., 2018). Some clients may offer free substances (Brooks-Gordon & Ebbitt, 2021). It can also be speculated that some clients may also offer more money for substance-related sexual contact, which could further contribute to a higher prevalence of substance use and making sustained recovery after treatment more challenging. However, the full impact of this dynamic requires further research.

It is plausible that psychological stress associated with SWTS could motivate chemsex involvement since previous research demonstrated a syndemic occurrence of psychosocial stress factors and substance use among sex workers (Mimiaga et al., 2021). The fact that the majority of SWTS participants did not see themselves as sex workers and all sex workers reported it as their non-primary source of income highlights the complexity of individual motivations and life circumstances related to SWTS among MSM in German-speaking countries. SWTS may fulfill several secondary purposes, such as complimenting earnings, or meeting emotional and psychological needs, or aligning with specific social or cultural expectations. These results underpin the relevance of addressing these issues for MSM-CX who are involved in SWTS and seeking to quit substance use.

SWTS takes many different forms; strict definitions may often exclude indirect or hidden forms of SWTS and may fail to capture the full range of people involved in this activity, resulting in the exclusion of individuals at higher risk for STIs and HIV from prevention services programs. This is also reflected by the fact that 83.3% of SWTS did not define themselves as sex workers. More research on transactional sex is needed to fully cover its amplitude. In recent years, one type of SWTS that has gained attention involves individuals engaging in relationships with older partners, commonly known as sugar relationships (Darmayanti et al., 2024). These relationships have been linked to a higher incidence of STIs in women (Kirkeby et al., 2022). However, there are currently no published studies that specifically examine this form of SWTS among MSM.

**Table 9** Outcomes among MSM according to engagement in SWTS receiving rewards

	Full Sample				MSM-CX				Full Sample				MSM-CX	
	SWTS		No-SWTS		SWTS		No-SWTS		SWTS		No-SWTS		H/X <sup>2</sup> (df)	p
	n	%	n	%	n	%	n	%	n	%	n	%		
Recent sexual partners <i>M(SD)</i>	83.4	(141.6)	24.8	(42.6)	100.5	(129.3)	48.0	(63.0)	28.80(1) <sup>a</sup>	<.001***	3.96(1) <sup>a</sup>	.047*		
Condom use														
Never	23	35.9%	84	28.8%	15	44.1%	43	50.6%	0.97(1) <sup>b</sup>	.326	0.19(1) <sup>b</sup>	.664		
Rarely	13	20.3%	43	14.7%	9	26.5%	16	18.8%						
Sometimes	8	12.5%	34	11.6%	3	8.8%	11	12.9%						
Often	12	18.8%	65	22.3%	5	14.7%	10	11.8%						
Always	8	12.5%	66	22.6%	2	5.9%	5	5.9%	2.67(1) <sup>c</sup>	.102	0.00(1) <sup>c</sup>	1.000		
Group sex	55	85.9%	173	59.2%	31	91.2%	68	80.0%	16.18(1)	<.001***	1.44(1)	.230		
Private sex parties	38	59.4%	89	30.5%	26	76.5%	56	65.9%	17.86(1)	<.001***	0.83(1)	.364		
STI														
No	36	56.3%	185	63.4%	13	38.2%	36	42.4%						
Yes	26	40.6%	100	34.3%	19	55.9%	47	55.3%	0.796(1)	.384	0.07(1)	.789		
One	11	17.2%	66	22.6%	8	23.5%	27	31.8%						
More than one STI	15	23.4%	34	11.6%	11	32.4%	20	23.5%	5.35(1) <sup>d</sup>	.021*	0.72(1) <sup>d</sup>	.395		
Do not know	2	3.1%	7	2.4%	2	5.9%	2	2.4%						
HIV														
Positive	18	28.2%	51	17.5%	13	38.2%	37	43.5%	4.12(1)	.042*	0.15(1)	.702		
Medical consultation	29	45.3%	35	38.4%	20	58.8%	50	58.8%	1.06(1)	.303	0.00(1)	1.000		
Psychologic/psychiatric treatment	33	52.4%	141	43.4%	20	60.6%	52	61.9%	0.22(1)	.640	0.02(1)	.897		
PREP use														
Never	25	54.4%	152	63.3%	7	33.3%	16	33.3%	0.97(1) <sup>b</sup>	.325	0.00(1) <sup>b</sup>	1.000		
Rarely	2	4.3%	3	1.3%	1	4.8%	0	0.0%						



The SWTS participants showed HIV rates higher than in previous research (Atkins et al., 2024; Berg et al., 2019). This aligns with the elevated prevalence of risk behaviors we observed, including greater substance use, more sexual partners and lower condom use, causing higher HIV rates. MSM who engage in SWTS have unique health risks; this indicates the need for specific, targeted interventions.

Our findings established that involvement in SWTS was related to more substance use, more risk behaviors and, among the overall sample, poorer health outcomes. MSM-CX who engaged in SWTS were significantly younger and tended to lower educational levels, which are often associated with lower economic resources. This may indicate that this population might engage in SWTS to supplement their earnings. The most commonly received reward among MSM-CX was substances, with this group also indicating greater substance use frequency compared to MSM-CX no-SWTS. This suggests that the interplay between substance use and SWTS should be faced as a vicious circle where the need for substances drives higher engagement in SWTS and involvement in SWTS leads to more substance use.

Economic and structural interventions are needed to improve access to prevention services to prevent risks related to Chemsex and SWTS effectively. A deep understanding of the economic, social, political, and behavioral factors driving SWTS among MSM is essential to develop effective and cost-efficient interventions.

Our sample reported a higher prevalence of chemsex than previous studies (range 3–29%) (Eustaquio et al., 2024; Maxwell et al., 2019). In our sample, MSM-CX reported high rates of overall substance use, high rates of IDU and high rates of engaging in risky behaviors, consistent with findings from previous research (Daskalopoulou et al., 2017; Frankis et al., 2018; Guerra et al., 2020; Sewell et al., 2017). Since HIV status is an outcome measured in a binary format (e.g., HIV-positive vs. HIV-negative), it might have created a ceiling effect, where once HIV is present, additional risk factors may no longer impact the outcome, making it harder to assess the combined effects of Chemsex and SWTS on this variable.

Risk factors such as pre-existing physical and mental health issues, pre-existing substance abuse, unemployment and a lack of access to healthcare can negatively impact health by increasing the likelihood of engaging in chemsex. This increases the risk of developing mental disorders, which can significantly lower a person's quality of life (Pozo-Herce et al., 2024).

Addressing chemsex requires a comprehensive understanding and a willingness to integrate education on prevention and harm reduction, as well as treatment and support services. This group needs a multidisciplinary approach that includes input from psychologists, drug support workers and sexual health clinicians (Tomkins et al., 2019). Chemsex and sexualized substance use present new and unique challenges. There is no fully developed and widely accessible treatment approach tailored to these issues and the lack of harm reduction strategies and interventions is associated with the practice of chemsex (Pozo-Herce et al., 2024).

Our study has some limitations that should be noted. It is exploratory and non-representative, so the findings may not accurately reflect the prevalence of chemsex among MSM. Participants were directly asked about substance use in sexual contexts, which may have introduced sampling bias, resulting in a higher reported prevalence of substance use. The cross-sectional study design does not allow for causal conclusions, and the results are limited to the specific time of data collection, preventing any insights into potential changes or long-term effects, its reliance on self-reported data could also have led to biases, particularly due to socially desirable responses. Additionally, promoting the study in queer

institutions and sexual health centers may have influenced the reported rates of HIV, STIs and access to treatment.

While we successfully engaged a significant number of Chemsex users, the questionnaire's availability in only two languages likely limited participation from a broader segment of the sex work population in German-speaking countries. As a result, the study may be biased toward middle-class participants, meaning the observed differences could be even more significant in lower socio-economic groups. It is important to note that the findings pertain to a specific subcultural group of MSM, which should be considered when interpreting the results.

A key strength of this study is its pioneering investigation of SWTS among MSM-CX. Our study collected data from a population considered hard to reach and highlighted SWTS as an important aspect of public health among MSM. This finding suggests that SWTS should be integrated into counseling and prevention interventions.

To effectively prevent risks related to both physical and mental health, it is essential to foster collaboration between health services for MSM and services for drug use prevention and recovery services. This partnership can improve awareness and access to care (Hung et al., 2023). Offering motivational interviewing and therapeutic education, along with testing and vaccinations, encouraging the use of PrEP and PEP and supporting the regular use of antiretroviral therapy are feasible strategies that should form the foundation of a comprehensive support system (Aslan et al., 2024; Rosenberger et al., 2021). Key strategies also include offering counseling based on a community-driven approach, speaking the language and using the terminology used among chemsex users and treating drug use as a health issue rather than a criminal matter (Stardust et al., 2018). Healthcare professionals must be informed and educated about chemsex, which will help reduce barriers and ensure continued access to care and support from trusted professionals early in their chemsex experience (Aslan et al., 2024).

## Conclusion

Our results confirm a significant association between chemsex use and SWTS, as well as their association with higher frequency of substance use and other risk behaviors and poorer health outcomes. However, among Chemsex users the involvement in SWTS did not show a significant worsening on health outcomes. These findings raise important questions regarding the social and psychological dynamics that might drive MSM towards chemsex and SWTS. The findings underscore the need for targeted interventions addressing the specific needs and risks of these subgroups to improve their health outcomes and social integration; these interventions should include SWTS since they present a significant association and SWTS itself is a high-risk factor. Implementing structural changes and incorporating harm reduction and anti-stigma strategies into sexual health services can lower the risk of HIV and STI transmission among MSM, particularly those engaged in chemsex and SWTS. Future research should continue to explore types of transactional sex, such as sugar relationships. There is an urgent need for more representative studies on chemsex involving the general population. Longitudinal studies are crucial for understanding causal relationships.

**Supplementary Information** The online version contains supplementary material available at <https://doi.org/10.1007/s11469-025-01466-6>.

**Acknowledgements** We particularly thank all participants for their time and contribution to this study. The data from this study can be provided upon request.

**Author Contribution** DDL, NKG, SK, MG: conceptualization, methodology, investigation, resources. DDL, AH: Funding acquisitions. AH, MG, TR: project administration and supervision. DDL, NKG: formal analysis, data curation, writing original draft, visualization. All authors: review and editing.

**Funding** Open Access funding enabled and organized by Projekt DEAL. This project received funding from the Department of Psychiatry, Psychotherapy and Psychosomatics of the Medical Faculty of the University of Augsburg. DDL received a doctorate scholarship from the Medical Faculty of the University of Augsburg.

## Declarations

**Conflict of Interest** This study is part of the doctoral thesis of Douglas Dubrovin Leão at the Faculty of Medicine, Augsburg University, Augsburg. Mr. Dr. med. Marcus Gertzen. Co-Founder of the “Junge Suchtmedizin“-Initiative, Chairman of the Board of the Federal Initiative on Sexualized Substance Use (BISS e.V.), Research funding by the Medical Faculty of the University of Augsburg, Lectures for the company Gilead, Hexal, as well as various drug aid and AIDS aid organizations in the German and Austrian area. Mr. Univ-Prof Dr. med. Alkomiet Hasan. Publisher of the WFSBP and DGPPN guidelines for schizophrenia and member of the IFCN-guideline group for rTMS treatment. AH received paid speakerships from Desitin, Janssen, Otsuka, and Lundbeck and was member of the Roche, Otsuka, Lundbeck, and Janssen Cilag advisory boards. The other authors declare that they have no conflict of interest.

**Open Access** This article is licensed under a Creative Commons Attribution 4.0 International License, which permits use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons licence, and indicate if changes were made. The images or other third party material in this article are included in the article's Creative Commons licence, unless indicated otherwise in a credit line to the material. If material is not included in the article's Creative Commons licence and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder. To view a copy of this licence, visit <http://creativecommons.org/licenses/by/4.0/>.

## References

- Aslan, A., Lessard, D., Lebouché, B., Bichard, I., Loze, B., Laussat, E., & Molina, J.-M. (2024). Harm reduction and multidisciplinary consultations for gay, bisexual, and other men who have sex with men practising chemsex based in a French infectious disease unit: Patients' characteristics and perceptions. *Sexual Health, 21*, SH23165. <https://doi.org/10.1071/SH23165>
- Atkins, K., Wiginton, J. M., Carpino, T., Sanchez, T. H., Murray, S. M., & Baral, S. D. (2024). Transactional Sex, HIV, and Bacterial STIs Among U.S. Men Who have Sex with Men. *American Journal of Preventive Medicine, 0*(0). <https://doi.org/10.1016/j.amepre.2024.07.002>
- Batisse, A., Eiden, C., Deheul, S., Monzon, E., Djeddar, S., & Peyrière, H. (2022). Chemsex practice in France: An update in Addictovigilance data. *Fundamental & Clinical Pharmacology, 36*(2), 397–404. <https://doi.org/10.1111/fcp.12725>
- Berg, R. C., Weatherburn, P., Marcus, U., & Schmidt, A. J. (2019). Links between transactional sex and HIV/STI-risk and substance use among a large sample of European men who have sex with men. *BMC Infectious Diseases, 19*(1), 686. <https://doi.org/10.1186/s12879-019-4326-3>
- Bohn, A., Sander, D., Köhler, T., Hees, N., Oswald, F., Scherbaum, N., Deimel, D., & Shecke, H. (2020). Chemsex and Mental Health of Men Who Have Sex With Men in Germany. *Frontiers in Psychiatry, 11*, 542301. <https://doi.org/10.3389/fpsy.2020.542301>
- Bourne, A., Reid, D., Hickson, F., Torres-Rueda, S., & Weatherburn, P. (2015). Illicit drug use in sexual settings ('chemsex') and HIV/STI transmission risk behaviour among gay men in South London:

- Findings from a qualitative study. *Sexually Transmitted Infections*, 91(8), 564. <https://doi.org/10.1136/sextrans-2015-052052>
- Brooks-Gordon, B., & Ebbitt, E. (2021). The Chemsex 'Consent Ladder' in Male Sex Work: Perspectives of Health Providers on Derailment and Empowerment. *Social Sciences*, 10(2), Article 2. <https://doi.org/10.3390/socsci10020069>
- Darmayanti, D. P., Idrus, N. I., Tang, M., & Hijjang, P. (2024). Love or Transaction: The Difference Between Sugar Dating and Conventional Dating. *International Journal of Religion*, 5(10), Article 10. <https://doi.org/10.61707/hztk2f59>
- Daskalopoulou, M., Rodger, A. J., Phillips, A. N., Sherr, L., Elford, J., McDonnell, J., Edwards, S., Perry, N., Wilkins, E., Collins, S., Johnson, A. M., Burman, W. J., Speakman, A., Lampe, F. C., & ASTRA Study Group. (2017). Condomless sex in HIV-diagnosed men who have sex with men in the UK: Prevalence, correlates, and implications for HIV transmission. *Sexually Transmitted Infections*, 93(8), 590–598. <https://doi.org/10.1136/sextrans-2016-053029>
- Dolengevich-Segal, H., Rodríguez-Salgado, B., Gómez-Arnau, J., & Sánchez-Mateos, D. (2016). Severe Psychosis, Drug Dependence, and Hepatitis C Related to Slamming Mephedrone. *Case Reports in Psychiatry*, 2016, e8379562. <https://doi.org/10.1155/2016/8379562>
- Edmundson, C., Heinsbroek, E., Glass, R., Hope, V., Mohammed, H., White, M., & Desai, M. (2018). Sexualised drug use in the United Kingdom (UK): A review of the literature. *International Journal of Drug Policy*, 55, 131–148. <https://doi.org/10.1016/j.drugpo.2018.02.002>
- European Centre for Disease Prevention and Control - ECDC. (2013). *EMIS 2010, the European men-who-have-sex-with-men internet survey :findings from 38 countries*. Publications Office. <https://data.europa.eu/doi/https://doi.org/10.2900/79639>
- European Centre for Disease Prevention and Control - ECDC. (2019). *EMIS-2017: The European men who have sex with men Internet survey: key findings from 50 countries*. Publications Office of the European Union. <https://data.europa.eu/doi/https://doi.org/10.2900/690387>
- Eustaquio, P. C., Smyth, J., & Salisi, J. A. (2024). The Risks for HIV and Sexually Transmitted Infections Among Men Who Have Sex with Men Who Engage in Chemsex in Low- and Middle-Income Countries: A Mixed Methods Systematic Review and Meta-Analysis. *AIDS and Behavior*. <https://doi.org/10.1007/s10461-024-04393-0>
- Felitti, V. J., Anda, R. F., Nordenberg, D., Williamson, D. F., Spitz, A. M., Edwards, V., Koss, M. P., & Marks, J. S. (1998). Relationship of childhood abuse and household dysfunction to many of the leading causes of death in adults. The Adverse Childhood Experiences (ACE) Study. *American Journal of Preventive Medicine*, 14(4), 245–258. [https://doi.org/10.1016/s0749-3797\(98\)00017-8](https://doi.org/10.1016/s0749-3797(98)00017-8)
- Frankis, J., Flowers, P., McDaid, L., & Bourne, A. (2018). Low levels of chemsex among men who have sex with men, but high levels of risk among men who engage in chemsex: Analysis of a cross-sectional online survey across four countries. *Sexual Health*, 15(2), 144–150. <https://doi.org/10.1071/SH17159>
- Giorgetti, R., Tagliabracchi, A., Schifano, F., Zaami, S., Marinelli, E., & Busardò, F. P. (o. J.). When "Chemsex" Meet Sex: A Rising Phenomenon Called "ChemSex". *Current Neuropharmacology*, 15(5), 762–770.
- Guerra, F. M., Salway, T. J., Beckett, R., Friedman, L., & Buchan, S. A. (2020). Review of sexualized drug use associated with sexually transmitted and blood-borne infections in gay, bisexual and other men who have sex with men. *Drug and Alcohol Dependence*, 216, 108237. <https://doi.org/10.1016/j.drugalcdep.2020.108237>
- Hockenhull, J., Murphy, K. G., & Paterson, S. (2017). An observed rise in  $\gamma$ -hydroxybutyrate-associated deaths in London: Evidence to suggest a possible link with concomitant rise in chemsex. *Forensic Science International*, 270, 93–97. <https://doi.org/10.1016/j.forsciint.2016.11.039>
- Hung, Y.-R., Chuang, T.-T., Chen, T.-W., Chung, A.-C., Wu, M.-T., Hsu, S.-T., Ko, N.-Y., & Strong, C. (2023). Utilization of mental health services in relation to the intention to reduce chemsex behavior among clients from an integrated sexual health services center in Taiwan. *Harm Reduction Journal*, 20(1), 52. <https://doi.org/10.1186/s12954-023-00777-y>
- IBM Corp. (2023, Released). *IBM SPSS Statistics for Windows, Version 29.0.2.0 Armonk, NY: IBM Corp*. <https://www.ibm.com/>
- Íncera-Fernández, D., Gámez-Guadix, M., & Moreno-Guillén, S. (2021). Mental Health Symptoms Associated with Sexualized Drug Use (Chemsex) among Men Who Have Sex with Men: A Systematic Review. *International Journal of Environmental Research and Public Health*, 18(24), 13299. <https://doi.org/10.3390/ijerph182413299>
- Kenyon, C., Wouters, K., Platteau, T., Buyze, J., & Florence, E. (2018). Increases in condomless chemsex associated with HIV acquisition in MSM but not heterosexuals attending a HIV

- testing center in Antwerp, Belgium. *AIDS Research and Therapy*, 15(1), 14. <https://doi.org/10.1186/s12981-018-0201-3>
- Kirkeby, K. M., Lehmilller, J. J., & Marks, M. J. (2022). Sugar Dating, Perceptions of Power, and Condom Use: Comparing the Sexual Health Risk Behaviours of Sugar Dating to Non-Sugar Dating Women. *Journal of Sex Research*, 59(6), 731–741. <https://doi.org/10.1080/00224499.2021.1962782>
- Knight, R., Carey, M., Jenkinson, P., & Preston, C. (2024). The impact of sexual orientation on how men experience disordered eating and drive for muscularity. *Journal of Gay & Lesbian Mental Health*, 28(2), 210–232. <https://doi.org/10.1080/19359705.2022.2118921>
- Leiner, D. J. (2019). *SoSci Survey (Version 3.5.02) [Computer software]*. Available at. <https://www.sosci-survey.de/>
- Maxwell, S., Shahmanesh, M., & Gafos, M. (2019). Chemsex behaviours among men who have sex with men: A systematic review of the literature. *The International Journal on Drug Policy*, 63, 74–89. <https://doi.org/10.1016/j.drugpo.2018.11.014>
- McMillan, K., Worth, H., & Rawstorne, P. (2018). Usage of the Terms Prostitution, Sex Work, Transactional Sex, and Survival Sex: Their Utility in HIV Prevention Research. *Archives of Sexual Behavior*, 47(5), 1517–1527. <https://doi.org/10.1007/s10508-017-1140-0>
- Meyer, I. H. (1995). Minority stress and mental health in gay men. *Journal of Health and Social Behavior*, 36(1), 38–56. <https://doi.org/10.2307/2137286>
- Mimiaga, M. J., Hughto, J. M. W., Klasko-Foster, L., Jin, H., Mayer, K. H., & Safren, S. A. (2021). Substance Use, Mental Health Problems, and Physical and Sexual Violence Additively Increase HIV Risk Between Male Sex Workers and Their Male Clients in Northeastern United States. *Journal of Acquired Immune Deficiency Syndromes 1999*, 86(3), 305–312. <https://doi.org/10.1097/QAI.0000000000002563>
- Muzi, L., Nardelli, N., Naticchioni, G., Mazzeschi, C., Baiocco, R., & Lingiardi, V. (2023). Body Uneasiness and Dissatisfaction Among Lesbian, Gay, Bisexual, and Heterosexual Persons. *Sexuality Research & Social Policy: Journal of NSRC: SR & SP*, 1–16. <https://doi.org/10.1007/s13178-023-00805-3>
- Oldenburg, C. E., Perez-Brumer, A. G., Reisner, S. L., Mayer, K. H., Mimiaga, M. J., Hatzenbuehler, M. L., & Bärnighausen, T. (2018). Human rights protections and HIV prevalence among MSM who sell sex: Cross-country comparisons from a systematic review and meta-analysis. *Global Public Health*, 13(4), 414–425. <https://doi.org/10.1080/17441692.2016.1149598>
- Pakianathan, M., Whittaker, W., Lee, M., Avery, J., Green, S., Nathan, B., & Hegazi, A. (2018). Chemsex and new HIV diagnosis in gay, bisexual and other men who have sex with men attending sexual health clinics. *HIV Medicine*, 19(7), 485–490. <https://doi.org/10.1111/hiv.12629>
- Pollard, A., Nadarzynski, T., & Llewellyn, C. (2018). Syndemics of stigma, minority-stress, maladaptive coping, risk environments and littoral spaces among men who have sex with men using chemsex. *Culture, Health & Sexuality*, 20(4), 411–427. <https://doi.org/10.1080/13691058.2017.1350751>
- Pozo-Herce, P. D., Martínez-Sabater, A., Sanchez-Palomares, P., Garcia-Boaventura, P. C., Chover-Sierra, E., Martínez-Pascual, R., Gea-Caballero, V., Saus-Ortega, C., Ballestar-Tarín, M. L., Karniej, P., Baca-García, E., & Juárez-Vela, R. (2024). Effectiveness of Harm Reduction Interventions in Chemsex: A Systematic Review. *Healthcare*, 12(14), 1411. <https://doi.org/10.3390/healthcare12141411>
- Rosenberger, C., Gertzen, M., Strasburger, M., Schwarz, J., Gernun, S., Rabenstein, A., Lerner, E., & Rütger, T. (2021). We Have a Lot to Do: Lack of Sexual Protection and Information-Results of the German-Language Online Survey „Let’s Talk About Chemsex“. *Frontiers in Psychiatry*, 12, 690242. <https://doi.org/10.3389/fpsy.2021.690242>
- Scheibin, F., Wells, J., Henriques, S., & Van Hout, M. C. (2021). „Slam Sex“—Sexualized Injecting Drug Use („SIDU“) Amongst Men Who Have Sex with Men (MSM) A Scoping Review. *Journal of Homosexuality*, 68(14), 2344–2358. <https://doi.org/10.1080/00918369.2020.1804258>
- Schmidt, A. J., Bourne, A., Weatherburn, P., Reid, D., Marcus, U., & Hickson, F. (2016). Illicit drug use among gay and bisexual men in 44 cities: Findings from the European MSM Internet Survey (EMIS). *International Journal of Drug Policy*, 38, 4–12. <https://doi.org/10.1016/j.drugpo.2016.09.007>
- Sewell, J., Miltz, A., Lampe, F. C., Cambiano, V., Speakman, A., Phillips, A. N., Stuart, D., Gilson, R., Asboe, D., Nwokolo, N., Clarke, A., Collins, S., Hart, G., Elford, J., Rodger, A. J., & Attitudes to and Understanding of Risk of Acquisition of HIV (AURAH) Study Group. (2017). Poly drug use, chemsex drug use, and associations with sexual risk behaviour in HIV-negative men who have sex with men attending sexual health clinics. *The International Journal on Drug Policy*, 43, 33–43. <https://doi.org/10.1016/j.drugpo.2017.01.001>

- Singer, M., Bulled, N., Ostrach, B., & Mendenhall, E. (2017). Syndemics and the biosocial conception of health. *Lancet (London, England)*, 389(10072), 941–950. [https://doi.org/10.1016/S0140-6736\(17\)30003-X](https://doi.org/10.1016/S0140-6736(17)30003-X)
- Stardust, Z., Kolstee, J., Joksic, S., Gray, J., & Hannan, S. (2018). A community-led, harm-reduction approach to chemsex: Case study from Australia's largest gay city. *Sexual Health*, 15(2), 179–181. <https://doi.org/10.1071/SH17145>
- Stoebenau, K., Heise, L., Wamoyi, J., & Bobrova, N. (2016). Revisiting the understanding of “transactional sex” in sub-Saharan Africa: A review and synthesis of the literature. *Social Science & Medicine*, 168, 186–197. <https://doi.org/10.1016/j.socscimed.2016.09.023>
- Strasser, M., Halms, T., R  ther, T., Hasan, A., & Gertzen, M. (2023). Lethal Lust: Suicidal Behavior and Chemsex-A Narrative Review of the Literature. *Brain Sciences*, 13(2), 174. <https://doi.org/10.3390/brainsci13020174>
- Stuart, D. (2016). A chemsex crucible: The context and the controversy. *The Journal of Family Planning and Reproductive Health Care*, 42(4), 295–296. <https://doi.org/10.1136/jfprhc-2016-101603>
- Tomkins, A., George, R., & Kliner, M. (2019). Sexualised drug taking among men who have sex with men: A systematic review. *Perspectives in Public Health*, 139(1), 23–33. <https://doi.org/10.1177/1757913918778872>
- Yelland, C., & Tiggemann, M. (2003). Muscularity and the gay ideal: Body dissatisfaction and disordered eating in homosexual men. *Eating Behaviors*, 4(2), 107–116. [https://doi.org/10.1016/S1471-0153\(03\)00014-X](https://doi.org/10.1016/S1471-0153(03)00014-X)

**Publisher's Note** Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

## Authors and Affiliations

Douglas Dubrovin Le  o<sup>1</sup> · Naiiri Khorikian-Ghazari<sup>1</sup> · Theresa Halms<sup>1</sup> ·  
Anna Martina Strasser<sup>1</sup> · Iana Ianovska<sup>1</sup> · Sinan Karcher<sup>2</sup> · Andrea Rabenstein<sup>2</sup> ·  
Tobias R  ther<sup>2</sup> · Alkomiet Hasan<sup>1,3</sup> · Marcus Gertzen<sup>1</sup>

✉ Douglas Dubrovin Le  o  
douglas.dubrovin.leao@med.uni-augsburg.de

<sup>1</sup> Department of Psychiatry, Psychotherapy and Psychosomatics, Faculty of Medicine, University of Augsburg, Geschwister-Sch  nert-Str. 1, 86156 Augsburg, Germany

<sup>2</sup> Department of Psychiatry, Ludwig-Maximilians-University Hospital Munich, Nu  baumstr. 7, 80336 Munich, Germany

<sup>3</sup> DZPG (German Center for Mental Health), Partner site Munich/Augsburg, Munich/Augsburg, Germany