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Chemsex Among Men Who Have Sex With Men: A Systematic Scoping Review of Research Methods

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ABSTRACT

Chemsex refers to the use of psychoactive substances with sex. We carried out a systematic scoping review of methodological characteristics of chemsex research among men who have sex with men (MSM), published between 2010 and 2020. For inclusion, chemsex had to be the main focus, and studies had to specify GHB/GBL, stimulant (amphetamine, crystal meth, ecstasy/MDMA, cathinones, cocaine) and/or ketamine use with sex as a variable. From 7055 titles/abstracts, 108 studies were included, mostly cross-sectional, and from Western countries. About one-third of studies recruited exclusively from clinical settings. A majority of these recruited from sexually transmitted infection (STI) clinics. The included quantitative studies analyzed possible associations between chemsex and STI health (40%), mental health (15%), drug health (12%), sexological health (10%), and post-diagnostic HIV health (7%). Most studies included GHB/GBL and crystal meth in their operationalization of chemsex. Definitions and operationalizations of chemsex vary greatly in the literature, and researchers of chemsex among MSM should consider ways in which this variation impacts the validity of their results. More studies are needed among MSM in non-high income and non-Western countries, and examination of possible links between chemsex and post-diagnostic HIV health, sexological health, and mental health.


KEYWORDS

MSM (men who have sex with men); LGBT health; Health; HIV; internalized homophobia; intersectionality; minority stress; psychology; sexual behavior; sexual health; stigma; substance use; chemsex; sexualized drug use; GHB/GBL; crystal meth

Background

Chemsex refers to the use of psychoactive substances in a context that involves sex (Ballesteros-López et al., 2016; Drückler et al., 2018; Roux et al., 2018; Skryabin et al., 2020; Tomkins et al., 2018; Turner et al., 2015). In research

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among MSM, drugs such as alcohol, cannabis, and poppers are typically excluded from definitions of chemsex (Glynn et al., 2018; Knoops et al., 2015; Skryabin et al., 2020). Chemsex is often defined as the sexualized use of specific drugs, and typically includes the use of drugs, such as GHB/GBL, crystal meth, and synthetic cathinones with sex. Some authors only consider chemsex to be occurring when either one of these three drugs are used with sex (Bourne et al., 2015; Drückler et al., 2018; Sewell et al., 2019), whereas others have defined chemsex to also include ketamine (Flores-Aranda et al., 2019; Frankis et al., 2018; Hibbert et al., 2019), ketamine or cocaine (Haugstvedt et al., 2018; Pakianathan, Whittaker, Lee et al., 2018), and amphetamine, ecstasy/MDMA or cocaine use with sex (Evers et al., 2019; Glynn et al., 2018; Gonzalez-Baeza et al., 2018; Skryabin et al., 2020; Van Hout et al., 2019). In addition to variations in drugs-based definitions of chemsex, some definitions are described as national rather than universal (Bourne, Reid, Hickson, Torres-Rueda, Steinberg et al. 2015; Evers, Van Liere et al., 2019; Sewell et al., 2019), excluding drug use with sex that is not consumed with a sexual purpose or intention in mind (Bourne, Reid, Hickson, Torres-Rueda, & Weatherburn, 2015; Pakianathan, Whittaker, Lee et al., 2018; Pufall et al., 2018; Wong et al., 2020), occurring among men who have sex with men (MSM) (Frankis et al., 2018; Hibbert et al., 2019; Roux et al., 2018; Tan et al., 2018), or taking place in extended sexual sessions that include multiple sex partners (Ahmed et al., 2016; Hibbert et al., 2019; Tan et al., 2018; Van Hout et al., 2019). One could hardly argue that an agreed and universally adopted definition of chemsex exists. Chemsex has been portrayed as being increasingly common among men who have sex with men (MSM) (Bourne, Reid, Hickson, Torres-Rueda & Weatherburn, 2015), particularly after technological innovations such as the Internet and smartphone technology changed the way people get into contact with one another (Donnadiu-Rigole et al., 2020; Drysdale et al., 2020; Guerra et al., 2020; Hibbert et al., 2021; Lafortune et al., 2021).

Sexological, mental, and drug health are all likely to be relevant for researchers concerned with health drivers and consequences of chemsex among MSM (Dolengevich-Segal et al., 2019; Hibbert et al., 2019; Lafortune et al., 2021; Shecke et al., 2019; Speulman et al., 2019). In an account of the origin of the word “chemsex,” Stuart suggests that MSM who use drugs such as crystal meth, GHB, and mephedrone with sex, do so in order to compensate for a reduced ability to enjoy sex, love, and relationships (Stuart, 2019). He argues that this reduction in sexological health and level of social/emotional intimacy is directly attributable to three factors: 1) societal homonegativity and 2) the trauma/stigma of the HIV/AIDS epidemic, both reinforcing representations of gay sex as dirty, disgusting, and dangerous, and 3) the intensification of a rejection culture between MSM after sexual networking moved to smartphone apps. Moreover, sexual identities other than heterosexuality generally carry a higher risk for poor mental health compared to the general population, resulting in higher rates of depression and anxiety, suicide, and substance use

disorders (King et al., 2008). In a study of crystal meth use with sex and mental health among MSM, Bonn, and colleagues note that this connection is often explained by the minority stress model, which highlights the role of ongoing stress and perceived and enacted stigma as a result of being part of a minority (Bohn, Sander, Kohler et al., 2020a).

Syndemic theory provides a theoretical framework that seeks to explain why co-occurring problems within different areas of health can interact and magnify one another within socially stigmatized groups (Singer, 2009). It highlights the importance of evaluating possible health drivers and consequences of chemsex within all clinical health domains where MSM are experiencing lower levels of health than the general population, and not only within the domain of sexually transmitted infections (STI). Furthermore, in the case of chemsex, there is not just one relevant type of stigma that may reinforce health inequalities in multiple areas of health at the same time. There are three types of stigmas of relevance to chemsex, namely that toward gay and bisexual men, drug use and positive HIV status. They may interact in different ways with one another, with chemsex, with health, and with other contingencies, a complexity that can be built into analytical models using intersectionality study frameworks.

To the best of our knowledge, to date, there are no analyses of the methodological choices made by researchers studying chemsex among MSM. Our literature search and screening process add to existing reviews by not limiting inclusion to studies of a certain health field only, for example, STI health. Researchers wishing to extract outcome variables from the studies included in our review, would benefit from the broad scope of our inclusion criteria regarding health fields, and the quality of the literature search and screening process.

Several researchers have highlighted the importance of the assumptions and methodological choices made by researchers of chemsex among MSM (Bryant et al., 2018; Drysdale et al., 2020; Souleymanov et al., 2019). Understanding methodological approaches is important in proper interpretation of the collected data, as they may differentially impact how they inform policy and research, and how practitioners might draw on chemsex research to improve health outcomes for MSM. The motivation for this study is to gain insight into how MSM chemsex research has evolved over the last decade, globally, and their methodological approaches and focus with respect to choice of MSM population, operationalization of chemsex, health outcomes, and other variables that may or may not be associated with chemsex. Such an analysis, which effectively both builds on and extends the work of existing reviews on chemsex, can offer important insights and a more diverse understanding of the chemsex-phenomenon and research thereof, and provide practitioners, researchers, and policymakers a foundation from which to advance in follow-up research.

To this end, we aimed to identify all research on chemsex among MSM, irrespective of study location or publication language, published between January 2010 and March 2020, and describe the research with respect to

location, publication year, eligibility criteria, recruitment arena, chemsex operationalization, and choice of variables that could be associated with chemsex among MSM.

Methods

The systematic scoping review methodology

We followed the guidelines in the Cochrane Handbook for Systematic Reviews of Interventions (Higgins et al., 2019) when defining the review question, searching for studies, selecting studies, and extracting data from eligible studies. We also followed Arksey and O'Malley's (Arksey & O'Malley, 2005) and Levac et al.'s (Levac et al., 2010) guidelines for scoping reviews and described our approach in a protocol, which we registered in the CRISTIN database (2058820). We report in accordance with the PRISMA-ScR reporting guideline (Tricco et al., 2018).

Inclusion criteria

First, we required chemsex to be the main focus of the study. We also required quantitative studies to specify a chemsex-variable that included at least one of the following eight drugs: GHB/GBL, stimulants (amphetamine, crystal meth, ecstasy/MDMA, cathinones including mephedrone, powder cocaine, crack cocaine), and ketamine. We chose to include these drugs in our operationalization of chemsex, because their use with sex had been defined and labeled as chemsex in previous studies. (Evers, Hoebe et al., 2019; Glynn et al., 2018; Gonzalez-Baeza et al., 2018; Skryabin et al., 2020; Van Hout et al., 2019).

Second, we included empirical research, meaning the record of someone's preplanned examination, observation, or experiences, to gain new knowledge and/or test existing knowledge, that includes a description of the methods for data collection and analysis (Goodwin, 2005). We included both quantitative and/or qualitative primary research, but not reviews.

Third, eligible studies were published in 2010 or later. This was based on the observation that chemsex practices among MSM fundamentally changed after the emergence of geosexual networking apps such as Grindr since 2009 (Deimel et al., 2016; Frankis & Clutterbuck, 2017; Tan et al., 2018). Smartphone technology has provided technological conditions facilitating relatively anonymous sexual and drug use networking with other MSM within close geographical proximity, through apps that are used globally.

Identifying and selecting relevant studies

We identified eight exemplar studies (Ahmed et al., 2016; Glynn et al., 2018; Hegazi et al., 2017; Melendez-Torres et al., 2016; Ottaway et al., 2017;

Pakianathan, Whittaker, Lee et al., 2018; Rich et al., 2016; Rosinska et al., 2018) from a previous review (Maxwell et al., 2019), that met our eligibility criteria. Next, we designed database-specific search strategies that were sensitive enough to find these exemplar studies and similar research, yet specific enough to exclude irrelevant records. The search strategies were designed by a literature search specialist (ER) in collaboration with the other research team members. We searched the following databases: MEDLINE (Ovid), EMBASE (Ovid), PsycINFO (Ovid), Web of Science Core Collection (SCI \square EXPANDED & SSCI) and ProQuest (Sociological Abstracts & Social Services Abstracts). See appendix 1 for the strategy used to search Medline.

The search was carried out in March 2020 (ER). Using Rayyan (Ouzzani et al., 2016), two researchers (EA and RB/AEM/VS) independently assessed all study titles and abstracts from the search against the inclusion criteria. In EPPI-Reviewer 4 (Thomas et al., 2020) we independently assessed full texts of studies that were deemed potentially relevant in the title/abstract screening, against the same inclusion criteria. If the two researchers disagreed on the inclusion of a study based on their title/abstract or full text, a third researcher was consulted.

Data extraction

One researcher (EA) extracted data from the included studies, using a pre-designed data extraction form. The extraction form was piloted on 20 studies. A second researcher (RB/AEM/VS) checked the accuracy and completeness of the extraction. Disagreements were resolved by reexamining the full study text and subsequent discussion. When necessary data were missing, we contacted study authors to obtain it. We received clarifications from authors of 15 publications (Drysdale et al., 2020; Feinstein et al., 2018; Friedman et al., 2014; Hegazi et al., 2017; Khaw et al., 2018; Mohammed et al., 2016; Pakianathan, Whittaker, Avery et al., 2018; Pakianathan, Whittaker, Lee et al., 2018; Schecke et al., 2019; Sewell et al., 2019; Souleymanov et al., 2019; Torres et al., 2020; Turner et al., 2015; Van Hout et al., 2019; Wong et al., 2020).

Based on the type of method used to analyze possible meanings of chemsex to MSM health, we classified each included study into one of the following mutually exclusive study categories: i) "Qualitative studies," ii) "Frequency studies," meaning quantitative studies with no association analysis of chemsex, iii) Association studies regarding chemsex, meaning quantitative studies with association analyses of chemsex, as operationalized in this review among MSM (labeled "MSM Chemsex Association studies"). iv) Association studies not specific to chemsex or MSM, meaning quantitative studies with association analyses of drug use with sex more generally, including other drugs than the operationalization of chemsex chosen for this review, or including <90% MSM in the analysis (labeled "Wider Association studies"), and v) Longitudinal studies, meaning quantitative studies

collecting measures of chemsex-engagement at two or more time points from the same individuals.

Our extraction also included: time of publication, study location, sample size, age of participants, participants' HIV status, recruitment arena, study eligibility criteria, operationalizations of chemsex (as stated in eligibility criteria or when reporting chemsex occurrence), and variable categories that researchers have tested for possible associations with chemsex: STI health, HIV health, sexological health, drug health, mental health and other health, relational factors, societal homonegativity-related factors, and behaviors. Appendix 2 describes the construction of these variables.

Analysis

We performed descriptive analyses in Stata (StataCorp, 2019), such as determining study and participant frequencies.

In summarizing the extracted data frequencies graphically, we sought to minimize the risk of reporting our data in a way that could exaggerate or understate differences and tendencies across the studies. One way to do so was to express results in terms of both number of studies and number of MSM participants. We made descriptive bar chart figures with Python v3.8.5 and the Matplotlib library v3.3.2.

For the purpose of our analysis, we created an aggregated “health” variable, in order to differentiate studies that did or did not consider chemsex against MSM health in cross-tabulations or statistical association analyses (see Appendix 2). Studies from more than one country were classified as such, and were not included when registering the locations of individual studies.

Consultation with stakeholders

For this optional step (Arksey & O'Malley, 2005), we shared and discussed the study protocol with the Norwegian HIV patient organization (HivNorge), and a queer chemsex user harm reduction organization (Chemfriendly Norge). The feedback was overall positive and resulted in one minor edit to our study protocol: to register which included studies required potential participants to have previous experience of sex work to participate. None of the included studies included sex work in their eligibility criteria.

Online evidence and gap map of research

In order to increase accessibility to primary research about chemsex among MSM—for researchers, health workers, MSM, and the general public—we created online research evidence and gap maps of the studies reviewed. The

classified 24% of studies as Qualitative, 16% as Frequency, 41% as MSM Chemsex association, 13% as Wider association, and 6% as Longitudinal studies. **Figure 1** illustrates how many studies from the seven study design categories were placed in each of the five study categories. Ten studies, all qualitative, described intentions to produce knowledge about underlying drivers of chemsex, while eight studies described an intention to examine consequences of chemsex, of which one was longitudinal.

Publication timing

When comparing how many studies were published in three equally long time periods since January 2010, research activity on chemsex increased between 2010 and 2020 (**Figure 2**). The number of publications increased by 117% from the first to the second time period, and by another 169% from the second to the third period. From the first to the third period, the increase was nearly fivefold (483%). The pattern was similar across study categories.

Participants

Number of MSM participants

Table 1 shows the median sample sizes and total number of MSM study participants in each of the five mutually exclusive study categories, and could be established for 91 of the 93 samples identified. Nine samples were

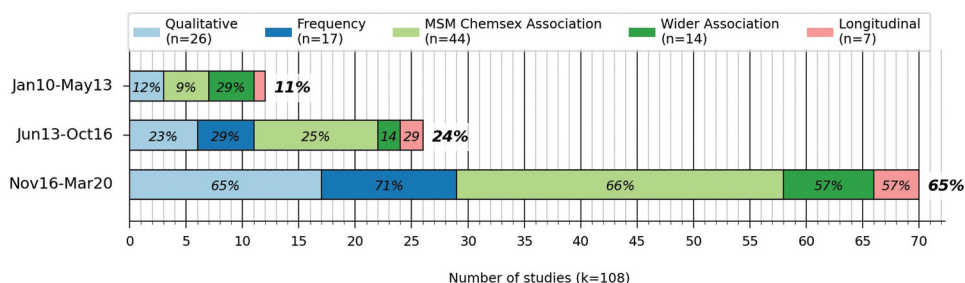


Figure 2. Timing of study publication. Numbers within each bar denote proportion of all studies within the same study category. All numbers to the right of each bar denote proportion of all included studies.

Table 1. Number of MSM participants.

| | All s = 91 | Qual s = 21 | Freq s = 17 | MSM Chemsex Assoc s = 35 | Wider Assoc s = 13 | Long s = 7 |
|------------------|---------------|----------------|----------------|--------------------------------|--------------------------|---------------|
| Absolute no (n) | 76 872 | 942 | 9 429 | 47 641 | 18 262 | 3 601 |
| Relative no. (%) | | 1% | 12% | 62% | 24% | 5% |
| Median no. | 326 | 33 | 30 | 722 | 516 | 326 |

Note: s = number of samples, n = number of MSM participants. Qual = Qualitative. Freq = Frequency. MSM Chemsex Assoc = MSM Chemsex Association. Wider Assoc = Wider Association. Long = Longitudinal.

Table 2. Study locations of the included studies.

| Countries | k | s | n | Countries | k | s | n | Countries | k | s | n |
|------------------------|---|---|-------|------------------------|---|---|-----|------------------------------|----|----|--------|
| Australia ^a | 8 | 8 | 3 682 | India ^c | 1 | 1 | 1 | Switzerland ^a | 1 | 1 | 7 107 |
| Belgium ^a | 1 | 1 | 1 529 | Ireland ^a | 2 | 2 | 496 | Taiwan ^a | 2 | 2 | 80 |
| Brazil ^b | 1 | 1 | 1 048 | Italy ^a | 2 | 2 | 3 | Thailand ^b | 2 | 2 | 1 412 |
| Canada ^a | 3 | 3 | 780 | Malaysia ^b | 1 | 1 | 20 | the Netherlands ^a | 8 | 7 | 15 173 |
| China ^b | 1 | 1 | 826 | Norway ^a | 1 | 1 | 516 | The UK ^a | 25 | 17 | 13 308 |
| France ^a | 3 | 3 | 292 | Russia ^b | 1 | 1 | 30 | The US ^a | 31 | 26 | 16 521 |
| Germany ^a | 2 | 2 | 745 | Singapore ^a | 1 | 1 | 30 | Vietnam ^c | 2 | 2 | 665 |
| Hong Kong ^a | 1 | 1 | 3 044 | Spain ^a | 4 | 3 | 915 | several | 4 | 4 | 9 192 |

Note: a = High Income Economy according to the World Bank. b = Upper Middle-Income Economy. c = Lower Middle-Income Economy. d = Low-Income Economy. k = number of studies. s = number of samples. n = number of MSM participants.

used in 25 different publications, and two of these contributed to studies in more than one of the five mutually exclusive study categories. The remaining 84 samples contributed to one publication each.

Study locations

The 108 included studies were from 23 different countries (Table 2). 87% of studies were North American, European, or Australian, and these included 79% of MSM participants. The US was represented by 29% of studies (21% of MSM participants), the UK by 23% of studies (21% of MSM participants), the Netherlands by 7% of studies (20% of MSM participants), and finally Australia by 7% of studies (5% of MSM participants). Concerning non-Western study locations, 10% of studies and 8% of MSM participants were from Asia, 1% of studies and 2% of MSM participants from Latin America & the Caribbean, and there were no studies at all from Africa. 9% of studies and 5% of MSM participants were from countries classified as middle-income economies by the World Bank (World Bank Country and Lending Groups, 2020).

Recruitment arenas

About one-third of the studies (34%) recruited samples from several types of recruitment arenas (Figure 3), and the mean number of arena types among studies with >1 type was 3.2. Regarding differences in recruitment arenas among study categories, there was a tendency to recruit from >1 arena type among the qualitative and longitudinal studies.

Roughly half (52%) of studies, with 54% of MSM participants, recruited exclusively from non-clinical arenas such as the Internet and/or LGBTQ+ social events/associations (Figures 3 and 4). About one-third (32%) of studies recruited their MSM participants exclusively from clinical arenas (33% of all MSM participants), among which STI clinics dominated (19% of studies, 30% of all MSM participants). Exclusive use of HIV clinics (6% of studies, 2% of all MSM participants) or drug services clinics (3% of

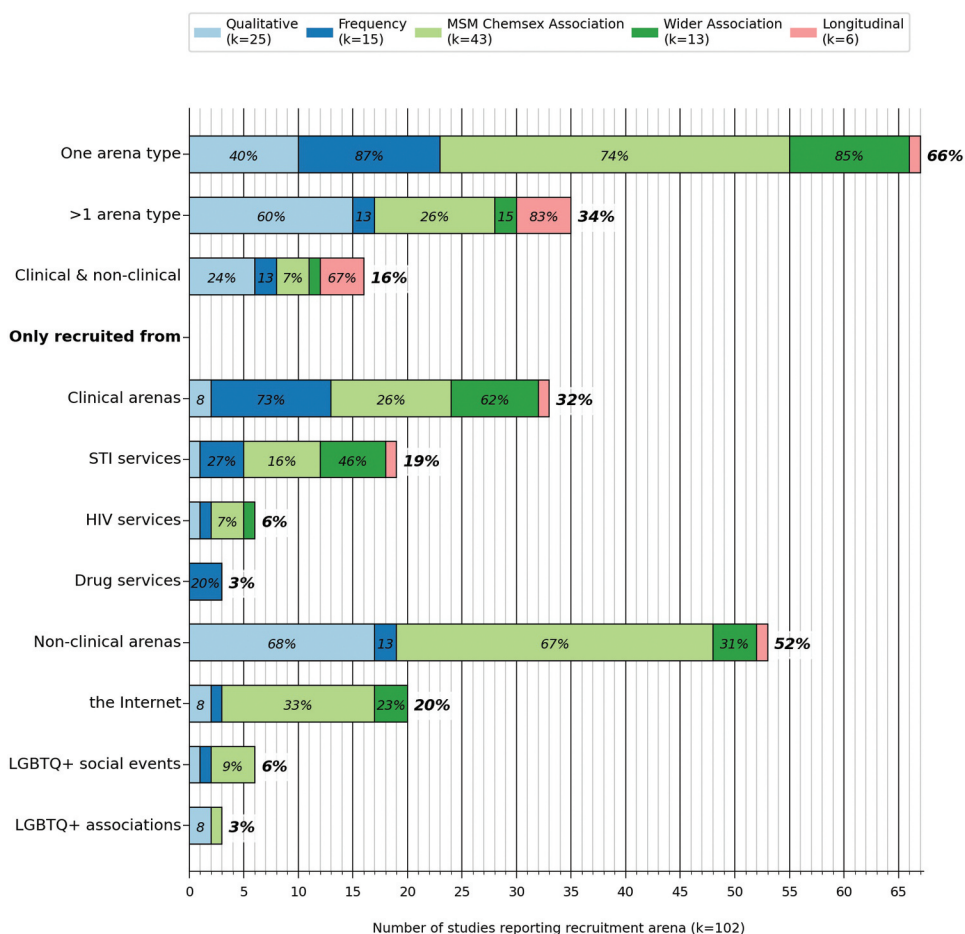


Figure 3. Recruitment arenas of the included studies (by number of studies). All numbers within each bar denote proportions of studies within the same study category. All numbers to the right of each bar denote proportions of all studies.

studies, <1% of all MSM participants) to recruit study participants was less common. No studies recruited participants via mental- or sexological health services.

Study-level eligibility criteria

About 1 in 5 studies (18%) required previous chemsex engagement for study participation, and these included only 1% of all MSM participants (Figures 5 and 6). Nine percent of studies (4% of all MSM participants) had as an eligibility criteria positive HIV status, and even fewer studies (2%, $n = 257$) recruited specifically MSM participants with positive HIV status, who at the same time had also engaged in chemsex. 13% of studies required negative HIV status, including four of the seven longitudinal studies. A small number of studies (4%) made drug health-related requirements for participation, such as

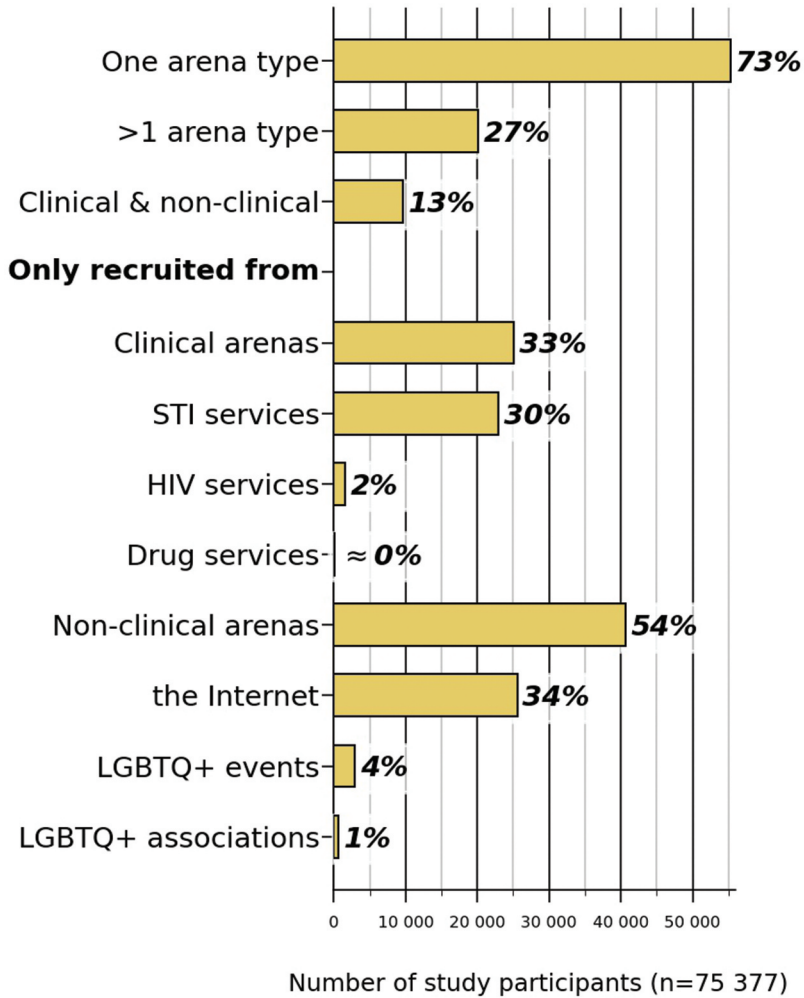


Figure 4. Recruitment arenas of the included studies (by number of MSM study participants). Numbers to the right of the bar denote proportion of all MSM participating in studies that report both recruitment arena(s) and number of MSM study participants.

a previously confirmed clinical diagnosis in drug health, screening scores indicating a high probability of a drug health diagnosis, or having received health services to address a clinical drug health condition. No studies specified mental or sexological health parameters as eligibility criteria.

Operationalizations of chemsex

The large majority of our included studies operationalized chemsex as part of their eligibility criteria or when reporting occurrence of chemsex (81%, k = 87). The remaining studies included multi-drug operationalizations including other drugs in addition to either GHB/GBL, stimulants (amphetamine, crystal

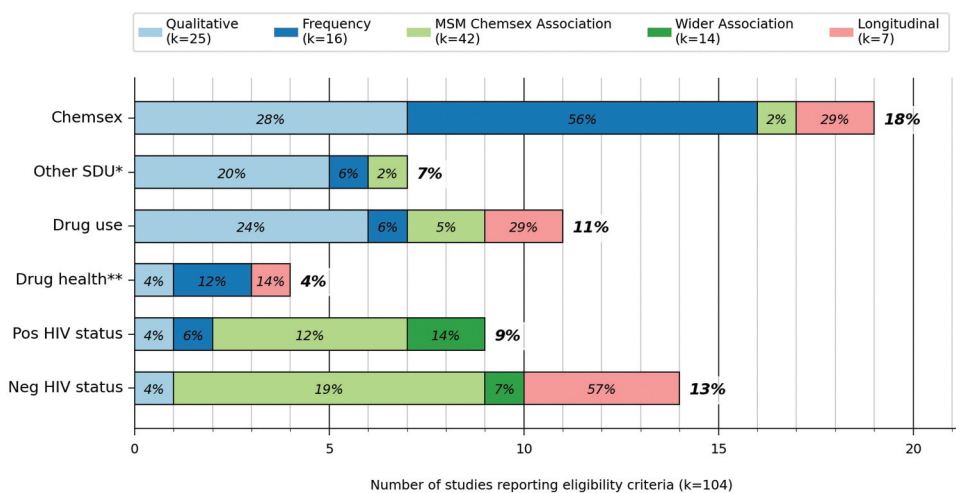


Figure 5. Eligibility criteria of the included studies (by number of studies). SDU* = use of other drugs with sex than GHB/GBL, stimulants (amphetamine, crystal meth, ecstasy/MDMA, cathinones, cocaine) and/or ketamine. Drug health** = relating to symptoms, diagnoses, follow-up, prognosis/complications of drug health condition in ICD-11. Proportions: all numbers within each bar denote proportion of studies within the same category. All numbers to the right of each bar denote proportion of all studies reporting eligibility criteria.

meth, synthetic cathinones, ecstasy/MDMA, powder cocaine, crack cocaine) or ketamine (6%, $k = 6$), or none at all (14%, $k = 15$) (not shown). We registered a total of 32 different multi-drug operationalizations, involving two to eight chemsex drugs. Figure 7 shows the extent to which each of the eight chemsex drugs were included in chemsex operationalizations, among the studies that included at least one such operationalization. The two drugs most frequently used in chemsex operationalizations were crystal meth (92%) and GHB/GBL (77%), while the least frequent drugs used were crack cocaine (15%) and amphetamine (25%). One-quarter ($k = 22$) of the studies with chemsex operationalizations collected data about chemsex engagement in the last 1–3 months, 18% ($k = 16$) in the last 4–6 months, and 28% ($k = 24$) in the last year (not shown).

Variables in cross-tabulations and statistical association analyses of chemsex

About three-quarters (72%, $k = 59$) of the 82 quantitative studies considered possible associations between chemsex and other variables through cross-tabulations or statistical association analyses, although only 15% ($k = 12$) of the same 82 studies were multivariate analyses of chemsex (Figure 8). About half of the quantitative studies (48%, $k = 39$) examined possible associations between chemsex and health variables in cross-tabulations or statistical association analyses. Associations with STI health ($k = 33$, 40%) was examined about five

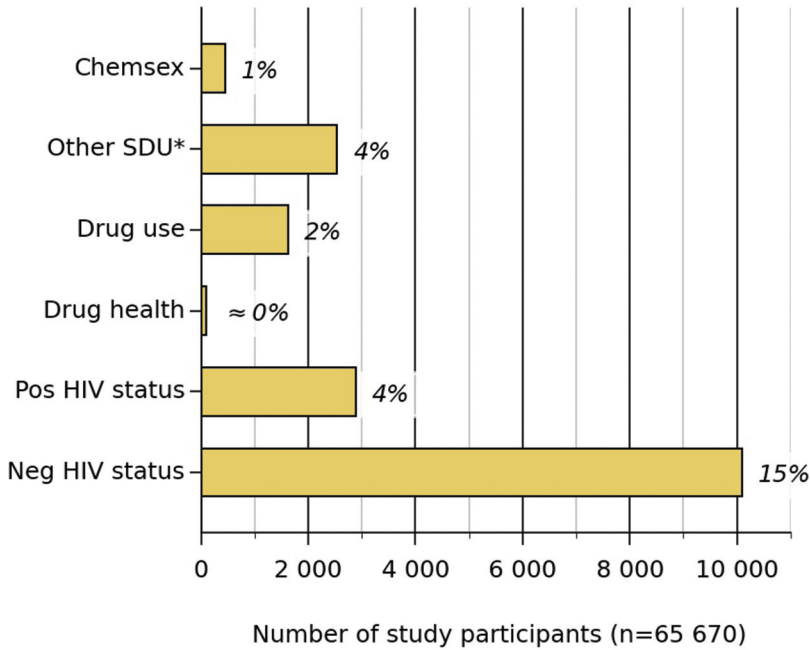


Figure 6. Eligibility criteria of the included studies (by number MSM study participants). *Other SDU = use of other drugs with sex than GHB/GBL, stimulants (amphetamine, crystal meth, ecstasy/MDMA, cathinones, cocaine) and/or ketamine. Numbers to the right of the bar denote proportion of all MSM participants in studies that reported both eligibility criteria and number of MSM participants.

times more frequently than associations with post-diagnostic HIV health (7%, $k = 6$), four times more frequently than sexological health (10%, $k = 8$), and three times more frequently than mental health (15%, $k = 12$). A small number of studies assessed the association of chemsex and relational factors (11%) and/or homonegativity-related factors (5%).

Only five of the 82 quantitative studies compared the health profiles of MSM engaging in different kinds of sexualized drug use, including chemsex. (Figure 8). Two studies examined differences specifically in health levels among MSM who use different drugs with sex. The first one tested whether MSM who use crystal meth with sex, compared to MSM who use other drugs than crystal meth with sex (including alcohol), experienced poorer STI, mental and/or drug health outcomes (Pakianathan, Whittaker, Avery et al., 2018). In addition to health outcomes, the same study considered differences in work and financial impacts between these two groups of MSM. The second study examined whether sexological, mental or STI health differences existed between MSM using GHB/GBL, crystal meth, synthetic cathinones or ketamine with sex, and MSM using other drugs than these with sex (including alcohol; Hibbert et al., 2019). The single case-control study we included in the review assessed whether chemsex engagement in the last year differed between MSM with positive HIV status who had or had not recently been diagnosed with acute

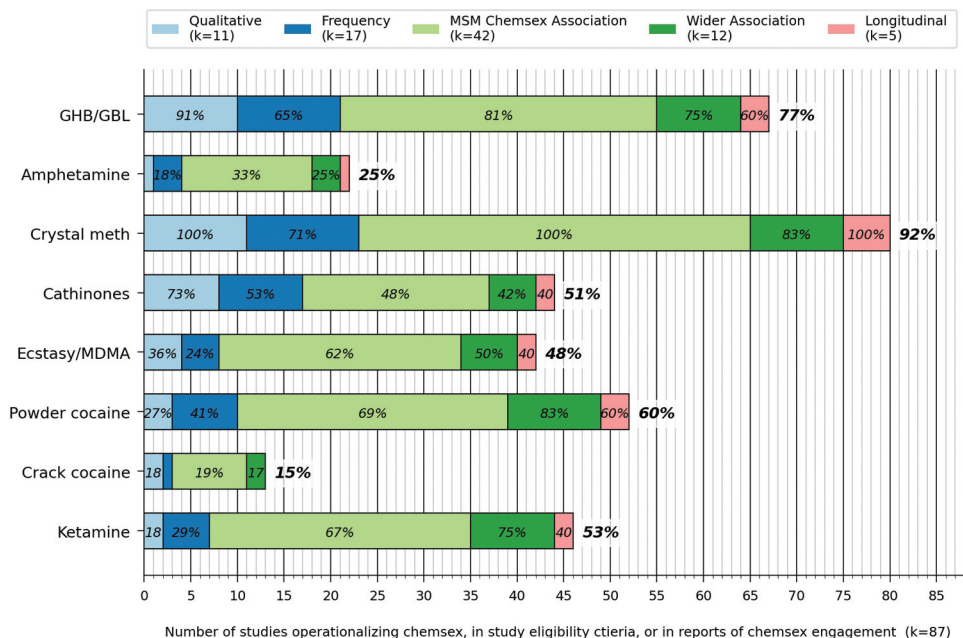


Figure 7. Drugs included in operationalizations of chemsex. Note: Numbers within each bar denote proportion of all studies within the same category. Numbers to the right of each bar denote proportion of all studies included in the review.

Shigellosis—a gastroenteric infection that can transmit sexually (Wu et al., 2019). Finally, we mention that among the seven longitudinal studies, one analyzed associations between an STI health outcome and chemsex engagement over time (Piyaraj, 2014). Three studies analyzed changes to one or more health variables over time, as well as changes to chemsex-engagement over time, but did not assess how changes to chemsex-engagement and health may relate to one another over time (Lyons et al., 2014; Mimiaga et al., 2019; Santos et al., 2014). The remaining three longitudinal studies did not consider changes to any health outcomes over time, focusing instead on behavior rather than health (Coyer et al., 2019; Reback et al., 2019; Sewell et al., 2019).

Discussion

Our systematic scoping review identified a number of characteristics of the rich body of chemsex research among MSM, consisting of 108 studies, 93 samples and about 77000 MSM from 23 different countries. We found that research activity on chemsex among MSM has increased since 2010, with two-thirds of the studies coming from either the US, the UK, the Netherlands, or Australia. The majority (62%) of the quantitative studies

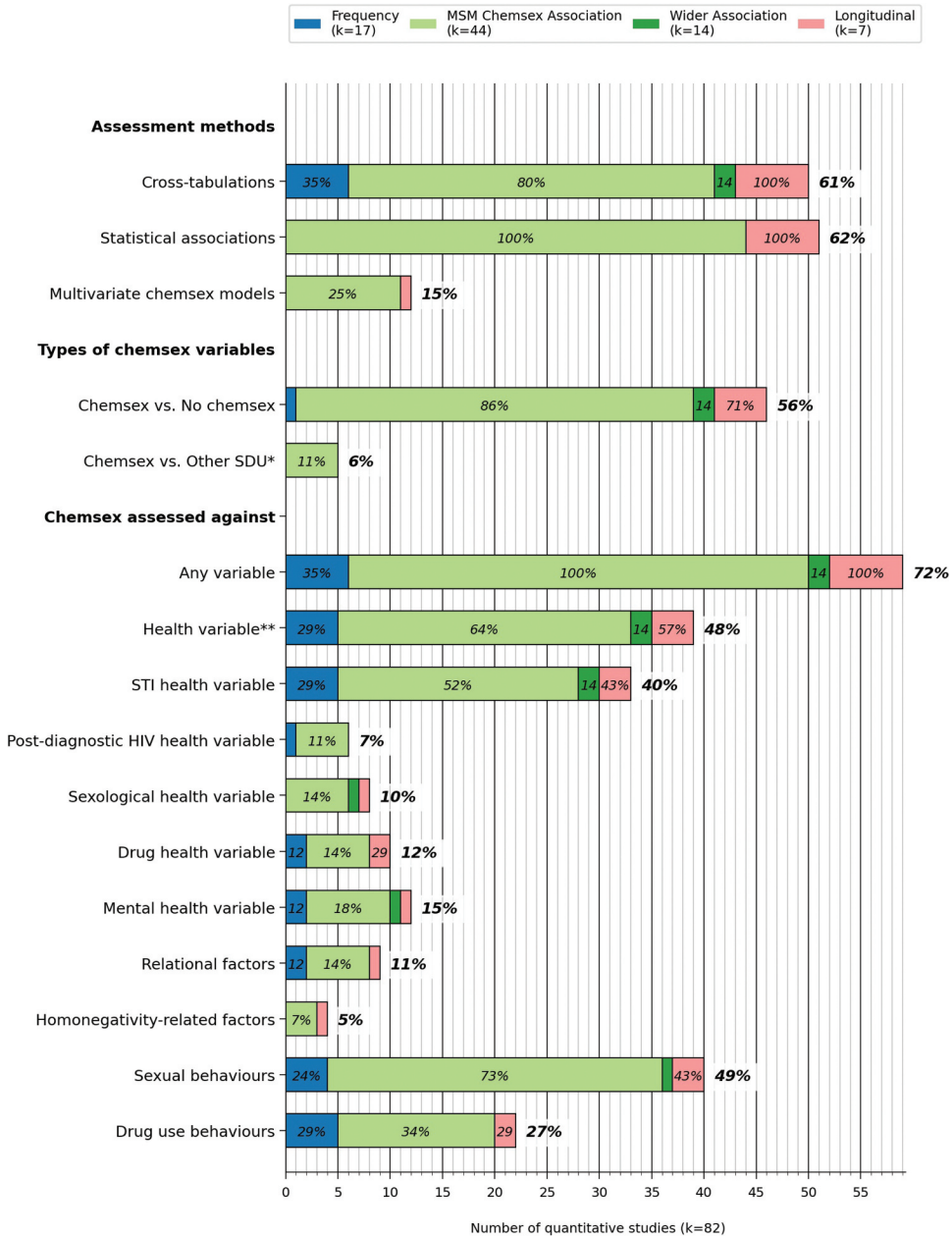


Figure 8. Quantitative assessments of chemsex against other variables. Numbers within each bar denote proportion of all quantitative studies within the same category. Numbers to the right of each bar denote proportion of all quantitative studies included in the review. *Other SDU = use of other drugs with sex than GHB/GBL, stimulants (amphetamine, crystal meth, ecstasy/MDMA, cathinones, cocaine) and/or ketamine **Health = STI, HIV, sexological, drug, mental, and/or other health. Appendix 2 provides details on the classification of variables measuring health symptoms, diagnoses, follow-up or prognosis/complications in one of these categories.

examined statistical associations with chemsex, while 24% of all included studies were qualitative.

We analyzed study locations and found that almost all studies of chemsex among MSM are from Europe, North America, or Australia, or from high-income economies outside these regions. With at least four understudied geographical MSM sub-populations in relation to chemsex, we recommend more chemsex research among MSM from Asia, Africa, and Latin America/the Caribbean, as well as in non-high-income countries in Europe. We recognize that one possible reason for the lack of traction regarding research on chemsex among MSM in these areas may be related to low societal acceptance of LGBTQ+ individuals. By comparing data from MSM who live in different cultural contexts, interactions between cultural factors and possible associations between chemsex and health outcomes can be assessed. For instance, societal homonegativity or relational factors could be measured in different cultural locations, and then incorporated into a cross-cultural international analysis of how they modify associations between chemsex and health outcomes. In their systematic review of chemsex among LGBTQ+ in relation to sexual health outcomes, Hibbert and colleagues call for an increase in international studies (Hibbert et al., 2021).

We examined how chemsex was operationalized in the literature and found that few studies examined or tested different drug-specific definitions of chemsex. We did not register any operationalization of chemsex in 19% of the included studies, and among the remaining 81%, we registered 40 different chemsex operationalizations. Of these, almost all included crystal meth and most included GHB/GBL. Relatively few operationalizations included crack cocaine or amphetamine. This suggests that researchers of chemsex among MSM consider the sexualized use of drugs such as crystal meth and GHB/GBL to be more relevant to MSM life and health than sexualized use of amphetamine. Moreover, 32 of the 40 operationalizations were multi-drug operationalizations of chemsex, and there was a tendency to use these to study possible associations between chemsex and health outcomes. As multi-drug variables do not allow for exploration of possible associations between chemsex and health on a drug-by-drug basis, it seems critical to start examining further the potential health differences and similarities between sexualized use of drugs such as amphetamine and crystal meth, or even GHB/GBL and crystal meth. Registering the individual drugs that each study participant in primary studies use with sex would allow for such examinations, and possibly reduce the risk of erroneously considering different drugs used with sex as equivalent to one another. Lafortune and colleagues note in their review that future latent class analyses are likely to reveal multiple profiles of sexual and non-sexual substance use among MSM, as well as their interplay with other variables (Lafortune et al., 2021), and we support that. As advanced statistical methods are being developed to meta-analyze structural equation models, it may be

possible to aggregate such profiles across studies in a future review (Cheung, 2015). In consideration of future low-threshold or harm reduction-based programs, MSM who wish to minimize health risks of chemsex would benefit from information about differences in health risks, depending on which drug is being used for chemsex.

Regarding focus of the included studies, we found that most of them had an individualistic focus, generally examining the possible associations between chemsex and presumed subsequent health drivers, outcomes, or behaviors. Many of these studies focused on the possible link between chemsex and STI health (including HIV status), which corresponds well with the high number of clinical studies recruiting from STI-clinics. Conversely, few studies explored possible associations between chemsex and sexological, drug, mental or post-diagnostic HIV health, relational factors, or experienced or internalized homonegativity. Similarly, none of the studies reviewed had recruited their participants through sexological or mental health clinical services, and relatively few studies had recruited through HIV (6%) and drug clinics (3%). None of the seven longitudinal studies considered changes in sexological or mental health against chemsex engagement over time, while the proportions of quantitative studies considering possible associations between chemsex and sexological (10%) and mental health outcomes (15%) were relatively low. From this we infer that researchers of chemsex among MSM have generally *not* designed their studies based on narratives proposing that MSM may engage in chemsex to reverse dysfunctions within sexological and/or mental health. Nor have they framed their research in line with theories such as the minority stress model, a research focus tendency highlighted by others as well (Bohn, Sander, Kohler et al., 2020a; Lafortune et al., 2021). We encourage additional consideration of the role of societal factors on chemsex, the possible interactions between co-occurring epidemics among MSM and societal homonegativity, and additional studies that assess associations between chemsex and levels of STI, sexological, drug, and mental health simultaneously.

Qualitative study findings suggest that some MSM with positive HIV status cope with sexological and mental health reductions caused by HIV stigma, by engaging in chemsex (Ahmed et al., 2016; Lafortune et al., 2021). Quantitative studies have found positive statistical associations between chemsex and HIV status among MSM (Bourne et al., 2014; Desai et al., 2018; Edmundson et al., 2018; Glynn et al., 2018; Graf et al., 2018; Hegazi et al., 2017; Ostrow et al., 2009; Pakianathan, Whittaker, Lee et al., 2018; Stevens et al., 2020; Tomkins et al., 2018). However, we only identified one quantitative study of chemsex among MSM that explored causal dynamics between these two variables. At this time, there seems to be scope for additional qualitative studies and eventually a qualitative evidence synthesis on the role of mental and/or sexological health in driving chemsex engagement among MSM generally, as well as specifically among MSM with positive HIV status, and MSM with clinical sexological or

mental health needs. In addition to the already mentioned low proportion (6%) of studies recruiting exclusively from HIV clinics, relatively few (9%) studies required positive HIV status from participants, and only 7% of quantitative studies considered chemsex against post-diagnostic HIV health in cross-tabulations or association analyses. All three findings highlight the scope that exists for additional chemsex studies particularly among MSM with positive HIV status. Further, given that 62% of the studies had a cross-sectional design, more longitudinal and large-scale studies are needed to address health drivers and consequences of chemsex, and changes to levels of chemsex-engagement over time. With regard to experimental study designs, the few intervention studies related to chemsex suggest an important area of future research. Among the seven longitudinal studies in the review, four required negative HIV status for participation and none required positive HIV status. In addition to the implied concern for management of HIV transmission risk when engaging in chemsex, it would be useful with studies that spotlight changes to health over time among MSM with positive HIV status (Table 3).

Strengths and limitations

We employed clear inclusion criteria and a systematic process for identifying relevant studies in any publication form. We used duplicate screening, data extraction by a second reviewer, and fit for purpose data analyses. The diverse skill set, experiences, and individual characteristics of the author group were a strength and included sexual and gender identity, age, profession, clinical experience, and experience in drug and MSM research. However, it is likely that gray literature could have been missed, and once new research is done, also systematic scoping reviews become outdated. In contrast to intervention reviews, for scoping reviews this is probably a minor problem, as it is unlikely that a handful of additional studies would change the results of the scoping.

Nonetheless, since our systematic literature search, we observe that a number of new studies on chemsex have been published, that would likely meet our inclusion criteria. While we have not systematically assessed these, we reference a handful below and note that they seem to strengthen our findings, in that they

Table 3. Proposed research agenda resulting from this systematic scoping review.

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- Support and prioritize chemsex research among MSM in Asia, Africa, and Latin America/the Caribbean, as well as non-high-income European countries.
 - Explore profiles of sexual and non-sexual drug use among MSM.
 - Design studies to explore whether MSM may engage in chemsex to reverse dysfunction within sexual and/or mental health. Qualitative studies examining these and other underlying drivers of chemsex are particularly appropriate designs, as will be a future systematic review of these studies.
 - Longitudinal studies that measure sexual, drug, and mental health over time, related to chemsex engagement.
 - Measure changes in health over time specifically among MSM with positive HIV status.
 - Increase participant engagement in clinical trial design.
-

are primarily from high-income countries (Curtis et al., 2020; Demant et al., 2022; Drückler et al., 2021), and have an individualistic focus, typically analyzing the possible associations between chemsex and presumed health drivers (Z. Wang et al., 2020), outcomes such as STI/HIV (Adler et al., 2022; Flores Anato et al., 2022; MacGregor et al., 2021), or behaviors (Drückler et al., 2021; Whitlock et al., 2021). This includes a few studies on drug dependency (Li et al., 2021), overdoses, also with fatal outcome, from chemsex use (Batisse et al., 2022; Cartiser et al., 2021; Drevin et al., 2021) and drug-drug interactions (De La Mora et al., 2022; Lee et al., 2021), and a few more cross-sectional and qualitative studies on drug health more generally (De La Mora et al., 2022; Peyriere et al., 2022). A study on psychological attachment style, emotional regulation and adverse childhood experiences relation to chemsex was published after our literature search was carried out (González-Baeza et al., 2022), in addition to other studies exploring different aspects of mental health in relation to chemsex (Batisse et al., 2022; Bohn, Sander, Köhler et al., 2020b; Gavín et al., 2021; Knoop et al., 2022; Tan, O'Hara et al., 2021). Relational factors (Herrijgers et al., 2020; Nagington & King, 2022), and homonegativity-related factors (Tan, Phua et al., 2021; Uholyeva & Pitoňák, 2022) are also covered in the published chemsex literature since March 2020. Recently, chemsex and possible interactions with new health challenges such as COVID-19 and mpox (previously known as monkeypox) have also started being explored (Ringshall et al., 2022; Roux et al., 2022; H. Wang et al., 2022), with for example, one study finding that the likelihood of practicing chemsex increased with use of PrEP to prevent COVID-19 transmission (Chone et al., 2021).

Conclusion

We carried out a systematic scoping review of chemsex among MSM within the last decade, and analyzed how researchers study chemsex among MSM, rather than summarizing study findings. There has been an increase in empirical research on this topic, but most research is among MSM communities in the West or other high-income locations, cross-sectional, and in the area of STI health correlates and behaviors. We identified several knowledge gaps that can be attributed directly to the methodological choices made by researchers, and we encourage future research to address those gaps.

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