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Methamphetamine use among men who have sex with men in Australia: A literature review



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December 2016

Acknowledgements

The authors thank Professor Gary Dowsett (Australian Research Centre in Sex, Health and Society, La Trobe University) and Professor Peter Aggleton (Centre for Social Research in Health, UNSW Australia).

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Suggested citation

Hopwood, M., Cama, E., & Treloar, C. (2016). *Methamphetamine use among men who have sex with men in Australia: A literature review*. Sydney: Centre for Social Research in Health, UNSW Australia. <http://doi.org/>

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Executive Summary

This review aimed to investigate methamphetamine use among men who have sex with men (MSM) in Australia and other developed regions to help build an understanding of the contexts where high-risk sex and drug use practices occur. This information can be used to inform the development of treatment and prevention interventions specifically for MSM.

Peer-reviewed journal articles, technical reports and editorials regarding meth/amphetamine epidemiology, methamphetamine use, sexual risk practice, prevention and treatment were located in searches of Medline, PsycINFO, The Cochrane Library and Google Scholar databases. The literature search was conducted to answer four research questions, and a literature review identified four main themes across the topic areas, namely: increasing methamphetamine use; risk associations; sex-based sociality; and, individual-level interventions. Within each theme there were several sub-themes. The review findings are organized around these themes and sub-themes in order to answer the research questions.

Main Findings

Increasing methamphetamine use

Despite some fluctuation in rates and some variation within affected groups, nationally we are seeing over the longer term, increasing rates of methamphetamine use among both young people and MSM in the major metropolitan communities.

However, among all MSM who have responded to the Perth Gay Community Periodic Surveys (GCPS), crystal use has remained stable during 2008 to 2016.

MSM report higher rates of methamphetamine use when compared with the broader Australian population. Crystal methamphetamine is the drug most commonly injected, particularly among HIV-positive MSM. HIV-positive men remain considerably more likely than HIV-negative men to report any injecting drug use.

Over the past decade, methamphetamine has increased in purity and decreased in cost.

Risk associations

The health risks associated with methamphetamine use are related to factors such as the frequency of use, the drug form (i.e., powder, base, or crystal) and the mode of drug administration, with the greatest risk being the regular injection of crystal. Crystal injection is associated with an elevated risk of dependence, mental health problems (e.g., depression, psychosis), heart problems, overdose, increased blood-borne virus

(BBV) infections and death.

Crystal injection among MSM, in particular HIV-positive men, is associated with increased risk behaviors for acquiring HIV, hepatitis C (HCV) and other sexually transmissible infections (STIs), such as the sharing of injecting equipment and participation in condomless, adventurous sexual practices.

There is evidence to suggest that the relationship between methamphetamine use and risk behavior is complex and that it is hard to establish direct causality. Several authors of large studies have suggested that methamphetamine attracts a hypersexual, risk-taking group of men who engage in unprotected sexual behaviors regardless of their methamphetamine use.

Most research into methamphetamine use, to date, has employed quantitative methods. This has contributed to a particular view of methamphetamine as a dangerous drug that leads to risky behavior and poor health outcomes. While there is robust quantitative evidence to support such a view, research using a variety of methods is needed to progress our understanding of methamphetamine use and risk behavior.

Further research using qualitative methods could help explain the risk associations identified in quantitative research, and qualitative methods would assist in shining a light upon factors, such as the meanings ascribed to methamphetamine use and risk practice among MSM.

Sex-based sociality

Sex-based sociality is a theme identified in MSM-related research and is used as a framework to describe the sexual construction of social life among MSM. This framework focuses attention on how men in contemporary, urban, gay communities socialise, often in groups and in places where sexual expression and activity have a central role.

The concept of sex-based sociality assists in drawing together drug use, sexual practice, BBV risk and MSM socialising through its focus on the inter-connected nature of MSM's lives and their drug- and sex-related risk practices.

The research literature usually characterizes drug use as an individual practice. Yet among MSM, drug use is often a collective practice, and is commonly connected to sex-based sociality. Sex and drug use among MSM need to be understood as socially mediated, co-occurring risk practices for BBVs, STIs and other negative health outcomes, requiring simultaneous sex-drugs interventions focused upon groups rather than individuals.

Methamphetamine, in particular crystal, is said to have an 'elective affinity' with urban gay sexual socializing (i.e., sex-based sociality) as it heightens a sense of sexual intimacy, disinhibition, and social connectedness, while enhancing sexual endurance. Among MSM, crystal use is one of a number of ways of increasing the range and intensity of sexual experience.

Qualitative research is needed to construct a broader and more sophisticated understanding of MSM's social-sexual contexts, their personal values, the meanings of drug use and the ways that MSM use drugs and socialize for sex, than is currently available from the research literature.

Individual-level interventions

Randomised controlled trials (RCTs) of interventions to prevent and to treat methamphetamine use have been limited to a focus upon individual-level, behavioral and cognitive interventions such as cognitive behavioral therapy (CBT), contingency management (CM), motivational interviewing (MI), and combinations of these. The results of such interventions have been mixed.

Currently, there are a limited number of studies of interventions for the treatment and prevention of methamphetamine use. In addition to too few studies, poly-drug use, which is common, has hampered the development of effective methamphetamine-focused treatment and prevention interventions.

Online harm reduction resources and health services for MSM who use illicit drugs exist, but there is little evidence that they have been rigorously evaluated.

Culturally appropriate interventions to reduce sex and drug risk practices among MSM are missing from the literature, and are urgently needed.

Recommendations for future action

To view MSM's drug use as a collective practice rather than seeing it as solely a practice of individuals.

To acknowledge that methamphetamine use among MSM has perceived benefits.

To conduct research into MSM from Perth and Western Australia who use methamphetamine.

To conduct research to develop specific, detailed information about methamphetamine use among MSM and to inform ongoing support to prevent BBV transmission, STIs and other harms among MSM.

To build a concurrent stream of work in knowledge translation to assist in developing new HIV, HCV and other STI prevention strategies and to support the relevant workforces.

To encourage researchers and policy-makers to adopt a frame of critical thinking about methamphetamine-related research and policy, in order to avoid 'problem inflation'.

To consider online sexual meeting community websites to disseminate harm reduction interventions.

To implement a HCV awareness campaign for MSM to highlight the risk of both HCV sexual transmission and transmission via the sharing of any injecting and/or smoking equipment.

To support the use of qualitative research to better understand the dynamics that underpin sex and drug use risk practice within sex-based sociality among Australian MSM.

To explore interventions that move beyond the individual-level.

1 Introduction

Methamphetamine is a drug used by men who have sex with men (MSM), where it has been associated with risk practices for the transmission of blood borne viruses (BBV) such as HIV and hepatitis C (HCV) and other sexually transmissible infections (STIs). The combination of drug use and group sex among MSM can facilitate the transmission of BBV and STI infections. This review examines methamphetamine use among MSM in order to better understand the social-sexual contexts of the drug's use, including the associated risks, and to help identify and develop effective interventions to reduce risky sexual and drug use practices.

Australian and international evidence demonstrates the importance of understanding these multiple and co-occurring risks, but also highlights the dearth of research available to design prevention responses that are relevant to and effective in affected communities. Recent evidence of increases in HIV infections and other STIs in Melbourne and Sydney (The Kirby Institute, 2015) indicates an urgent need to address systemic failures to engage with methamphetamine-related risk in relation to sexual activity, and a failure to design effective harm reduction for MSM that connects the two. Innovative, national and local approaches are needed to educate MSM methamphetamine users about the risks of BBV and STI transmission and other harms (Lyons et al, 2013).

This review investigates methamphetamine use among Australian MSM to help build an understanding of the contexts where high-risk sex and drug use practices occur (hereafter, 'sexual contexts'). Previous research has shown the increased risk of HIV and other BBV/STI transmission when methamphetamine is injected within sexual contexts (Holt et al, 2015). Methamphetamine use is also associated with drug dependence and physical and mental health problems (Degenhardt et al, 2008; McKetin et al, 2006).

Despite these significant public health challenges, there has been no published peer-reviewed research to date that has systematically explored the relationship between methamphetamine use, BBV transmission and sexual risk-taking among MSM in Australia. In the current situation of rising HIV and HCV infections, research is urgently needed to help understand the antecedents of unsafe sexual practices, and the sharing of injecting equipment, when MSM use methamphetamine in sexual contexts, with a view to identifying those practices that need to be addressed by, and are entry points for, prevention interventions.

Research informs policy aimed at reducing methamphetamine-related harms, and precision and rigor in methamphetamine-related research and policy-making is needed to avoid 'problem inflation' (Moore and Fraser, 2015). Moore and Fraser (2015) identify four key problematic trends that concern methamphetamine-related research and policy, namely: (i) producing research knowledge carelessly and uncritically, where the authors highlight

how methamphetamine researchers make choices about methods, theory, statistical tests etc. that can lead to diametrically opposed findings, for example, about the harms of methamphetamine use (e.g., compare the findings of Darke and colleagues' (2008) review with those of Degenhardt and colleagues' (2008) analyses of five databases); (ii) causation, regarding the obfuscation of the relationship between patterns of methamphetamine use and forms of methamphetamine harm; (iii) the use of research knowledge in policy (e.g., where policy reproduces shortcomings in research, or policy documents seldom define key terms such as 'drug dependence' and 'drug abuse'); and, (iv) ignoring the complexity of drug effects in research and policy, whereby there is an over reliance upon quantitative and biomedical research to make sense of methamphetamine use with scant attention paid to qualitative research and the historical, political, economic and social dimensions of methamphetamine use (Moore & Fraser, 2015).

In summary, the trends within methamphetamine-related research and policy identified by Moore and Fraser (2015) point toward problem inflation. Research has a profound responsibility to treat its objects of investigation with greater rigor and precision than is evident in some studies. Similarly, policy-makers must critically assess the research about methamphetamine, by applying rigor and precision (Moore & Fraser, 2015). Until further studies are conducted into methamphetamine use among MSM, and intervention development and evaluation occurs, researchers and policy-makers who work in MSM-related research and policy are advised to avoid problem inflation.

2 Method

2.1 Research questions

As specified in the proposal and in meeting with the Government of Western Australia Department of Health, this search of the key academic databases and other sources was structured to answer three questions (questions 1-3 below). An additional request was made by the Department of Health via teleconference to include literature about interventions to reduce risk practice among methamphetamine users (question 4).

1. What patterns of methamphetamine use are common among Australian MSM?
2. What health risks are associated with these patterns of use?
3. What is 'sex-based sociality' and how does this mode of sexual socialising influence risk practices that contribute to BBV/STI transmission and other harms among MSM?
4. Which interventions have been demonstrated to reduce methamphetamine use and/or sexual risk behavior among MSM?

2.2 Context

The literature search included any international and Australian research literature pertaining to methamphetamine use and sexual behavior among MSM, with an emphasis on Australian research. Sources searched for evidence were:

1. Peer-reviewed journal articles, editorials and commentaries via the Cochrane Library, Medline and PsycINFO databases.
2. Searches of other academic databases, including PubMed and Google Scholar and Google for reports of government departments and non-government organisations, news stories and media accounts of methamphetamine use.
3. Website searches for publications of relevant research centres, including: Australian Research Centre for Sex, Health and Society (La Trobe University), Centre for Social Research in Health (UNSW), The Kirby Institute (UNSW), National Drug and Alcohol Research Centre (UNSW), and National Drug Research Institute (Curtin University).

2.3 Search strategy

Cochrane Database of Systematic Reviews

Search terms: Title, Abstract, Keywords

- Methamphetamine hydrochloride OR methamphetamine

- Drug inject*
- HIV
- Sexually transmissible infections
- Gay men
- MSM
- Sexual behavior
- Unsafe sex
- Interven*
- Contingency management
- Cognitive-behavioral therapy

Total: Four systematic reviews of RCTs focused upon treatment and prevention.

Medline, PsycINFO and Google Scholar databases

Search terms: Title, Abstract, Keywords

- Crystal
- Methamphetamine
- Drug use
- Drug inject*
- HIV
- Sexually transmissible infections
- Sexually transmitted diseases
- Gay men
- MSM
- Sexual behavior
- Unsafe sex
- Interven*
- Contingency management
- Cognitive-behavioral therapy

Total: 220 Medline records and 86 PsycINFO records covering methamphetamine epidemiology, sex- and drug-related risk practice, and treatment and prevention.

2.4 Search method and results

Peer-reviewed journal articles, technical reports and editorials regarding methamphetamine epidemiology, drug use, sexual risk practice among MSM, health outcomes of

methamphetamine use (and other illicit drug use), and interventions for prevention and treatment were located in searches of Medline, PsycINFO, the Cochrane Library and Google Scholar databases. An initial search of the Cochrane Library found four systematic reviews of: media campaigns to prevent uptake of illicit drug use among young people; reviews of treatment for cocaine dependency and amphetamine dependency; and a review of urinary pharmacokinetics of methamphetamine. These records were not included in this current review as they did not include reference to MSM and sex- and drug-related risk practice. A subsequent search of the Cochrane Library, employing the Trials filter, located 18 research articles that reported on randomized controlled trials (RCTs) of interventions to reduce methamphetamine use. Thirteen of these articles had been identified in previous database searches; five of the remaining RCT articles were selected for review, and four of these articles were considered suitable for inclusion in the final literature review.

Based on literature searches conducted to answer the research questions, a total of 96 articles, predominantly peer-reviewed, were read and grouped according to their research focus (i.e., methamphetamine epidemiology, MSM sex- and drug-related cultures and risk practice, and treatment and prevention interventions). The research represented within articles included in this review was critically assessed for rigor and precision in accordance with recommendations by Moore and Fraser (2015). Articles needed to be critical and reflexive in regards to study method and findings, and to contain a clear, meaningful discussion of results. Ultimately however, all research contains bias, and all studies have limitations. Effort was made to only include articles that achieved a balance between rigor in research and a contribution to answering the research questions; for example, some themes, such as sex-based sociality had far fewer articles of any quality to assess and include in the review compared to the large volume of articles focused upon the epidemiology of methamphetamine use and associated risks. Similarly, there was a dearth of qualitative and mixed-methods research to include. The final list of articles presented in this review, in general, reflect a high research standard.

The findings are presented in narrative form and are written in language accessible to the lay reader who has an understanding of basic statistics. Some technical phrases and abbreviations are used, however while minimized this language could not be completely avoided. If researchers referred to 'crystal' or 'crystal methamphetamine' in their articles, the authors of this report used the same term. However, the form of methamphetamine was not always clearly stated by authors in publications. Similarly, some studies refer to 'gay men', 'homosexually active men', and 'gay and bisexual men' rather than 'MSM'. Accordingly, the authors of this report used the specific terminology reported in studies. Finally, Appendix B comprises a review of additional articles for those readers seeking further detail.

3 Findings

The review identified four main themes, namely: increasing methamphetamine use; risk associations; sex-based sociality; and, individual-level interventions. The review findings are organized around these themes, and several sub-themes, in order to answer the research questions. Each theme is defined and discussed at the beginning of each section.

3.1 Increasing methamphetamine use

The main theme to emerge from a review of the epidemiology of methamphetamine in Australia was increasing methamphetamine use, particularly the use of crystal methamphetamine. Despite some fluctuation in rates and some variation within affected groups, nationally we are seeing over the longer term, increasing rates of methamphetamine use among both young people and MSM in the major metropolitan communities of the eastern states, but not among MSM in Perth and Western Australia, where rates have been stable since 2008. Similarly, while in the larger metropolitan centres we are seeing increasing rates of injecting drug use among MSM who use crystal methamphetamine, in Perth and Western Australia injecting drug use has been stable among MSM since 2008.

Increasing rates of methamphetamine use in Australia's larger cities, including crystal use among MSM, is a major public health concern because it is occurring in a context of: (i) an increase in the rate of condomless anal intercourse with casual partners among HIV-negative men (from 27% in 2005 to 35% in 2014, $p < 0.001$), which is the primary driver of new HIV infections in Australia (de Wit et al, 2015; Zablotska et al, 2010); (ii) an increase of 13% between 2005 and 2014 in newly diagnosed HIV infections (The Kirby Institute, 2015); (iii) the proportion of men testing HIV antibody positive increased from 1.4% in 2011 to 2.2% in 2015 (Memedovic et al, 2016); (iv) the proportion of respondents reporting methamphetamine as the last drug injected increased from 27% in 2011 to 36% in 2015 (Memedovic et al, 2016); (v) a total of 10,621 cases of newly diagnosed HCV infection reported in Australia in 2014 (The Kirby Institute, 2015); and (vi) a high rate (41%) of sharing injecting equipment among MSM, a primary risk factor for HCV transmission (Hopwood et al, 2015a).

Methamphetamine use among the Australian population

Over the past five years in Australia, there have been substantial increases in the number of regular and dependent methamphetamine users, particularly among people aged 15 to 34 years (Degenhardt et al, 2016), and crystal methamphetamine is described as 'very easy' to obtain (Stafford et al, 2016). As well, the rate of methamphetamine injection increased nationally between 2011 and 2015 (Memedovic et al, 2016). There has been an observed trend away from the use of the less potent powder form ('speed') towards the use of the

more potent crystal methamphetamine, with more people reporting regular crystal use, as well as an increase in the average purity of crystal and a decline in the purity-adjusted cost (Degenhardt et al, 2016; Scott et al, 2015; Stafford et al, 2016). Regular crystal use is associated with an elevated risk of dependence, mental health problems (e.g., depression, psychosis) and BBV risk (McKetin et al, 2006; Degenhardt et al, 2016; Darke et al, 2008). These problems are more likely to occur among people using crystal compared with less potent forms of methamphetamine, and among regular users (McKetin et al, 2006). It has been also suggested that these changes are responsible for increases in drug-related harms and presentations to treatment services and emergency departments (Australian Institute of Health and Welfare, 2015; Roxburgh & Burns, 2015).

Methamphetamine use among Australian MSM

Compared with the broader Australian population, Australian MSM report high rates of methamphetamine use, with crystal being the drug most commonly injected (Lea et al, 2013). This is particularly an issue for HIV-positive MSM. In the 2013 Australian National Drug Strategy Household Survey, MSM were significantly more likely to report methamphetamine use in the previous 12 months compared with heterosexual men (9.7% vs. 2.5%; adjusted odds ratio=2.9, $p<0.01$) (Roxburgh et al, 2016). Data from national behavioral surveillance surveys of MSM show that rates of crystal use in the previous six months significantly increased during 2010 and 2014 (from 9.6% to 11.4%, $p<0.001$), while speed use decreased (from 15.2% to 10.2%, $p<0.001$) (Lea et al, 2016). HIV-positive MSM were significantly more likely to report crystal use compared with HIV-negative and untested men (21.4% vs. 7.3%; adjusted odds ratio=1.9, $p<0.001$) (Lea et al, 2016). Among men who reported crystal use, rates of recent injecting increased between 2005 and 2014 (18.7% to 28.7%, $p<0.001$). HIV-positive MSM who used crystal were also considerably more likely to report recent injecting compared with HIV-negative and untested men (53.8% vs. 21.9%, $p<0.001$) (Lea et al, 2016). There is evidence that methamphetamine treatment services, with a high caseload of MSM clients, are currently operating at capacity in Australian capital cities (Findlay, 2015; Scott & Branley, 2015).

Methamphetamine use among MSM in Perth and Western Australia

The Perth Gay Community Periodic Survey (Perth GCPS) is a longitudinal, cross-sectional study of gay and homosexually active men (i.e., MSM) who live in Perth and other parts of Western Australia. Data collection for the Perth GCPS occurs every two years (Lee et al, 2016a). As the survey report highlights, its major aim is to provide data on sexual, drug use and testing practices related to the transmission of HIV and other STIs among MSM. The tenth and most recent Perth GCPS was conducted in February 2016 where 900 men were recruited. The majority of men in the 2016 survey (72%) were recruited from gay men's social venues and community sites such as bars, sex-on-premises venues, a sexual health clinic and via Perth Pride Fair Day. The remainder (28.0%) participated in an online version of the survey. There were a number of differences between men recruited online and men recruited through venues and events, with the online sample being younger, more likely to be born in Australia, more likely to live outside the Perth metropolitan area and more likely to report that they did not know their HIV status. Compared to men recruited through venues

and events, men recruited online were more likely to report condomless anal intercourse with both regular and casual partners than were men recruited face-to-face, and men recruited online were less likely to report HIV and STI testing than men recruited offline (Lee et al, 2016a).

Opposing the national trend, data collected from the Perth Periodic Survey shows that crystal methamphetamine use has remained stable during the reporting period (i.e., the past six months). And when compared with previous years (i.e., 2008-2016), there has been no significant change in the rate of crystal use among all MSM respondents to the Perth GCPS. Similarly, there has been no change in the rate of crystal use among HIV-positive MSM between 2008 and 2016, however among HIV-negative MSM there has been a significant decrease (14.2% vs. 10.4%, $p < 0.05$) in the rate of crystal use between 2012 and 2016 (Lee et al, 2016a). Conversely, since 2012, the proportion of men who reported the use of one or two drugs has increased significantly (33.1% vs. 37.3, $p < 0.01$), while the proportion of men who reported the use of more than two drugs has declined (23.4% vs. 20.5%, $p < 0.001$).

In general, HIV-positive men remain more likely to report any illicit drug use compared with HIV-negative men, which is a pattern commonly reported among MSM in developed regions of the world. In Perth and Western Australia, among all MSM, the rate of injecting drug use in 2016 was 4.2%, which has remained stable since 2008. In Perth and Western Australia, HIV-positive men remain considerably more likely than HIV-negative men to report any injecting drug use (14.7% vs. 3.4% in 2016). In 2016, 15.1% of all men reported using 'party drugs' (undefined, but often refers to ecstasy, cocaine, ketamine and other psychostimulants) for sex in the six months prior to the survey and fewer than one in ten men (8.2%) said they had engaged in group sex during or after drug use. The proportion of men using party drugs for sex has decreased over time (19.4% vs. 15.1%, $p < 0.05$) (Lee et al, 2016a).

Summary of increasing methamphetamine use

Compared with the broader Australian population MSM reported high rates of methamphetamine use, with crystal being the drug most commonly injected, particularly among HIV-positive MSM. Crystal use among MSM is occurring in a context of rising risk factors, including increasing condomless anal intercourse with casual partners among HIV-negative men, an increase in newly diagnosed HIV infections, and high rates of STIs, HCV, and injecting equipment sharing among MSM. In recent years, there has been an increase in the average purity of methamphetamine and a decline in the purity-adjusted cost.

Crystal use has remained stable during 2008 to 2016 among all MSM respondents to the Perth Gay Community Periodic Surveys (GCPS). However, interestingly, among HIV-negative MSM there has been a significant decrease in the rate of crystal use between 2012 and 2016. In Perth and Western Australia, HIV-positive men remain considerably more likely than HIV-negative men to report any injecting drug use. In 2016, around 15% of all men surveyed reported using party drugs for sex in the six months prior to the GCPS and fewer than one in ten men said they had engaged in group sex during or after party drug use.

Please refer to Appendix B (page 42) for further discussion of methamphetamine use among the general population in Perth and Western Australia.

3.2 Risk associations

An overarching theme identified in the review concerned the statistical association between methamphetamine use, risk practice and poor health outcomes, labelled in this review as risk associations. Across the research literature, methamphetamine use among MSM is consistently linked to sexual practice and contexts (i.e., sex-based sociality) where BBV and STI transmission occurs. Furthermore, an analysis of articles in the review identified a sub-theme regarding research methods; there is a bias toward the use of quantitative research methods to describe methamphetamine use in terms of statistical risk associations. This sub-theme highlights a gap in the research literature; studies using qualitative research methods are needed to help explain the meanings behind observed risk associations in quantitative surveys.

Risk practice and health impact

The health risks associated with methamphetamine use are reportedly extensive and varied with risk related to factors such as the frequency of use, the drug form (i.e., powder, base, or crystal) and the mode of drug administration, with the greatest risk being the regular injection of crystal (Degenhardt et al, 2008). Regular crystal injection is associated with an elevated risk of dependence, mental health problems (e.g., depression, psychosis) and BBV risk (Darke et al, 2008; Degenhardt et al, 2016; Holt et al, 2015). These problems are more likely to occur among people using crystal compared with those using the less potent forms of methamphetamine, and among regular crystal injectors (Holt et al, 2015; Lim et al, 2015).

Frequent crystal injection also presents a greater risk for overdose (Degenhardt et al, 2008). It has been suggested that the change from powder methamphetamine to crystal methamphetamine is responsible for increases in drug-related harms and presentations to treatment services and emergency departments (Australian Institute of Health and Welfare, 2015; Lim et al, 2015; Roxburgh & Burns, 2015). Degenhardt and colleagues (2008) reported that population level harms have been more difficult to estimate compared to the harms of methamphetamine use found in sentinel groups of regular drug users, such as people who inject drugs (PWID).

Over several decades, research has found that drug use in general, including alcohol use, is associated with risk behavior for HIV infection among gay men and other MSM (e.g., Bull et al, 2002; Hirshfield et al, 2004; Prestage et al, 2009a; Southgate & Hopwood, 2001). Similarly, the use of methamphetamine among MSM is reportedly associated with increased risk behaviors for acquiring HIV infection and other STIs in numerous studies from Australia and around the world (e.g., Bourne et al, 2015a, 2015b; Eu & Roth, 2014; Green & Halkitis, 2006; Reback 1997). While occasional crystal use can be unproblematic (Leonard et al, 2008), the regular and longer-term use of crystal and other drugs in sexual contexts, particularly via injection, is associated with an increased likelihood of engaging in high-risk sexual practices for BBV transmission, such as condomless anal intercourse with casual partners, multiple sex partners, group sex and brachio-rectal insertion (commonly referred to as 'fisting', which is the practice of anal penetration using a whole hand) (Green & Halkitis, 2006; Kippax et al, 1998; Rawstone et al, 2007; Halkitis et al, 2014; Prestage et al, 2007b; Vosburgh et al, 2012; Vu et al, 2015).

Of note, the rate of injecting drug use is around ten times higher among MSM than among men in the general population (Lea et al, 2013), which places MSM at increased risk of BBV infections, in particular HCV infection. In a recent study, men who injected were more likely than men who did not to be HIV-positive, HCV-positive, to have recently used drugs during sex and to have had condomless anal intercourse with casual partners (Lea et al, 2013). HIV-positive MSM, particularly those who engage in high risk practices in sexual contexts, are highly vulnerable to HCV infection through the sharing of injecting equipment and via sexual transmission (Rawstorne et al, 2007; Kippax et al, 1998; Hurley & Prestage, 2009; Jin et al, 2010; Matthews & Dore, 2008; Deacon et al, 2013; Danta et al, 2007; van de Laar et al, 2010), and to the problems associated with living with HIV and HCV co-infection (Matthews & Dore, 2008).

In a 2013 study of HCV infection among MSM, 41% of survey respondents reported sharing injecting equipment (Hopwood et al, 2015a). Importantly, the sharing of injecting equipment was significantly more likely among MSM who injected crystal in sexual contexts, and among men who reported spending much of their free time socialising with other MSM. The rate of sharing equipment reported in the study was higher than rates of equipment sharing reported in the 2014 Australian Needle and Syringe Program Survey (30%), an annual survey of people who inject drugs (Iversen & Maher, 2015). The study's findings suggest a poor awareness for the potential of HCV transmission through sharing injecting equipment. Conversely, as discussed in the next section of the report, such high rates of sharing equipment may be indicative of particular social meanings influencing injecting (Fraser et al, 2014) in particular sexual contexts.

Research methods

Research into drug use and sexual behavior among MSM has often used quantitative methods, in particular self-report cross-sectional surveys. However, the bi-directionality of cross-sectional designs limits our understanding of these data to statistical statements of association between drug use and BBV/STI-related risk practice (Prestage et al, 2009a). Causality is harder to establish (Degenhardt et al, 2010). To date, relative to quantitative research designs, few qualitative studies of methamphetamine using MSM have been conducted. This field of research could benefit greatly from a larger number of studies which employ a diverse range of methodologies such as ethnography in order to understand the dynamics behind statistical associations and to develop effective strategies to reduce harm.

In an effort to build an evidence-base to assemble effective interventions to reduce methamphetamine use, sexual risk practice and HIV and other STI infections, Mimiaga and colleagues (2008) conducted in-depth interviews in Boston Massachusetts with 20 methamphetamine-using HIV-positive MSM who reported acquiring HIV infection in the context of using crystal methamphetamine. The study findings revealed participants' beliefs about the 'highly destructive' effects of the drug and its likely role in their HIV acquisition. Participants described a rapid escalation of methamphetamine use following initiation, moving from social use to sexual use. Half of the sample reported bingeing on crystal, sometimes continuously for several months. Condomless anal intercourse, anonymous sex and 'aggressive' sex were reported by 20% of the sample (n=4) following their HIV-

positive diagnosis, and many spoke about the chronic depression and anxiety that followed cessation of methamphetamine use (Mimiaga et al, 2008).

Echoing findings by Chew Ng and colleagues (2013) (see Appendix B), nearly two-thirds of participants in Mimiaga and colleagues' (2008) study believed that the online sexual meeting community websites presented a major starting point for their crystal influenced sexual hook-ups, and as such these sites should be considered a starting point for harm reduction interventions (Mimiaga et al, 2008). Participants believed there was a need for interventions to deglamorize methamphetamine use, in part by highlighting how dependent use can eventually destroy men's physical appearance.

In an article from a qualitative study of 'chemsex' (i.e., sex on drugs) among gay men from the inner southern London gay community boroughs of Lambeth, Southwark and Lewisham (Bourne et al, 2015a, 2015b), participants reported using gamma hydroxybutyrate (GHB), mephedrone, and crystal methamphetamine to enhance their sexual experiences. Similar to findings from Mimiaga and colleagues' (2008) study, some participants believed that their drug use had led them unwittingly to take risks and was directly implicated in their HIV acquisition while conversely others said that they maintained strict rules regarding condom use when using drugs. HIV-positive gay men said that their drug use facilitated sex with more men and for longer periods. Similar to the conclusions drawn by Australian researchers (i.e., Degenhardt et al, 2010; Prestage et al, 2009a, 2009b; Rawstone et al, 2007), Bourne and colleagues concluded that many HIV-positive participants' reports of condomless anal intercourse were unlikely to have been due to their drug use, however, chemsex did sometimes lead men in this study to have risky sex (Bourne et al, 2015a, 2015b).

Summary of risk associations

The health risks associated with methamphetamine use are related to factors such as the frequency of use, the drug form and the mode of drug administration. Regular crystal injection is associated with an elevated risk of dependence, mental health problems, heart problems, overdose, increased BBV/STI infections and mortality. These problems do not affect all users, but appear more likely to occur among people injecting crystal compared to the less potent forms of methamphetamine, and among regular users.

Among MSM, the observed strong association between risky sexual behavior and methamphetamine use is instructive; crystal methamphetamine appears to augment MSM's sex drive and enable users to stay high for extended periods, which can increase the likelihood of multiple sexual encounters with multiple sex partners over an extended time. Authors of several studies have suggested that crystal use per se does not necessarily drive unsafe sexual behavior. Rather, they suggest that methamphetamine attracts a hyper-sexual, risk-taking group of men who engage in unprotected sexual behaviors regardless of their methamphetamine use. The factors that cause HIV risk among methamphetamine using MSM may be more complex than simply methamphetamine use or drug use generally. MSM who use methamphetamine (and other drugs), at the least, require specific, detailed information and ongoing support to prevent BBV transmission, STIs and other harms. Online sexual meeting community websites could be a starting point for harm reduction interventions.

3.3 Sex-based sociality

A theme running through the social research literature was the call for researchers to effectively engage with the inter-connected nature of MSM's sexual socializing, which has been termed sex-based sociality. Sex-based sociality is a unique, gay-community pattern of social relations and sexual interaction, which offers a framework to describe the sexual construction of social life among MSM. This framework focuses attention on how men in contemporary, urban, gay communities socialise, often in groups and in places where sexual expression and activity have a central role. It can be witnessed *inter alia* in gay dance parties, in sex-on-premises venues and saunas, and in private parties, where group sex and collective drug use is commonplace (Kippax et al, 1998; Hurley & Prestage, 2009; Slavin, 2004a). Very few peer-reviewed publications in this review engaged meaningfully with MSM's social-sexual contexts, particularly regarding the 'elective affinity' between sex-based sociality and the pharmacological properties of methamphetamine, and risk and health outcomes. On the contrary, studies mostly individualized MSM's methamphetamine use and risk practice, whereby poor health outcomes such as BBV infections were largely seen to be a product of poor decisions by individuals.

Dowsett and colleagues (2005: 31) have argued that sex-based sociality has helped produce distinctively 'gay ways of using drugs', whereby MSM become part of interconnected relations of sex and drug use that, in turn, build stronger engagement with aspects of gay community life through friendship and sexual networks. For some MSM, socialising in sexual contexts involving crystal use heightens a sense of sexual intimacy, disinhibition, social connectedness, enhanced sexual endurance, reduced sense of pain, and increased social connectedness (Bourne et al, 2015b; Chartier et al, 2009; Halkitis et al, 2014; Leonard et al, 2008; Prestage et al, 2007a; Prestage et al, 2009a & 2009b; Rawstone et al, 2007; Reback, 1997; Slavin, 2004a & 2004b). Consequently, the ways MSM use crystal, are not only informed by, but also add to, the meanings and understandings that MSM share about drugs and sex. Injecting drug use and sharing (e.g., drugs, injecting equipment and/or sex toys) add further dimensions of intimacy and connectedness to sex-based sociality. Separate Australian studies by Dowsett and colleagues (2005) and by Southgate and Hopwood (2001) have identified how specific patterns of socialising associated with drug use, in private and commercial spaces, have become normalised and deeply embedded within gay communities.

The concept of sex-based sociality assists in drawing together drug use, sexual practice, BBV risk and MSM socialising through its focus on the inter-connected nature of MSM's lives and their drug- and sex-related risk practices (Kippax et al, 1998). It is important to understand that sexual relations within sex-based sociality are qualitatively different from sexual relations in long-term couples (Hurley & Prestage, 2009; Fraser et al, 2014). For example, sex and drug use in sexual contexts such as public saunas may involve two casual partners, groups of five to ten men, or at private sex parties groups of 30 to 40 men or more. In these sexual contexts, social benefits accrue to MSM who participate in commonly valued practices such as crystal use. However currently we know very little about 'gay ways of using drugs', the social meanings these carry, and their risks in relation to HIV and BBV transmission (Dowsett et al, 2005).

To effectively intervene in sex-based sociality to reduce BBV/STIs and other harms associated with methamphetamine use among MSM, approaches will be required that move away from viewing drug use and sex as practices of individuals, to encompass a broader and more sophisticated understanding of MSM's social-sexual spaces. This includes an analysis of MSM's inter-connected social and sexual relationships, their personal values, the meanings of drug use in social-sexual spaces and the ways that MSM use drugs and socialize for sex.

Collective drug use, sex and risk practice

To date, most drug- and sex-related research has tended to appraise drug- and sex-related risk as different and separate problems, to be addressed in separate if related policy responses, most usually focused upon individuals (Anglemyer et al, 2011; Cavacuiti, 2004). Although useful, such an approach obscures the social embeddedness of sexual, injecting and equipment sharing practices, and their links to different kinds of sexual activity. Moreover, a focus on individuals alone precludes the development of effective harm reduction strategies that take account of MSM's shared drug-use practices, sexual norms, and sexual contexts (i.e. how they can act together to prevent harm in ways that are relevant to MSM). To understand increasing rates of crystal injection, high rates of injecting equipment sharing and increased sexual risk practices among MSM, sexual practice should be viewed as a collective activity, and drug use in sexual contexts as a phenomenon grounded in MSM's sex-based sociality and relationships. Research that adopts such an approach will yield information that can be directly used to develop strategies to minimise injecting-related harm and sexual risk practice in MSM's sexual contexts.

Drawing upon 49 interviews with a sample of gay and bisexual men from Manhattan, Green and Halkitis (2006) argued that because of crystal methamphetamine's pharmacological properties, it is used strategically by gay and bisexual men to negotiate sex-based sociality and to increase sexual pleasure; the particular pharmacological effects of crystal are said to have an 'elective affinity' with urban gay settings and gay sexual subcultures. In Green and Halkitis' (2006) study, gay and bisexual men strongly favoured crystal methamphetamine despite its use within sexual subcultures being linked to unsafe sexual practice or the social conditions that exacerbate HIV/STI risk.

Translating and implementing sex-based sociality for BBV/STI risk reduction

In-depth accounts of gay community and MSM norms and practices of sex-based sociality and the place of crystal methamphetamine are currently needed, and with a concurrent stream of work in knowledge translation, would assist in developing new HCV and HIV prevention strategies and in supporting the relevant workforces. Such studies are important to conduct now, not only because there is a greater availability of crystal and a documented increase in its use in Australia (Degenhardt et al, 2016; Eu & Roth, 2014; Iversen & Maher, 2015), but also because organisations that provide for the health education needs of gay communities currently report that they do not know what forms of explicit crystal-focused community-based health education are needed, particularly if these are to add more impact to longstanding sex-focused health promotion messages related to HIV. It is important therefore to know how HCV also is understood by MSM and how this understanding affects

risk practice, because sex-based sociality often includes sharing (e.g., injecting equipment, lubricant and sex-toys) among numbers of men, which can efficiently transmit HCV as well as HIV between unwary MSM. HCV and HIV transmission among MSM need to be addressed together to circumvent the longer-term costs associated with BBV infections, particularly co-infection.

Summary of sex-based sociality

Sex-based sociality is a framework, and an overarching theme in the social research literature, that focuses attention on how men in contemporary, urban, gay communities socialise, often in groups and in places where sexual expression and activity have a central role. The concept of sex-based sociality assists in drawing together drug use, sexual practice, BBV risk and MSM socialising through its focus on the inter-connected nature of MSM's lives and their drug- and sex-related risk practices. In these sexual contexts, social benefits accrue to MSM who participate in commonly valued practices such as crystal methamphetamine use.

Because of its pharmacological properties, methamphetamine, in particular crystal, is said to have an 'elective affinity' with urban gay sexual socializing as it heightens a sense of sexual intimacy, disinhibition, and social connectedness, while enhancing sexual endurance. Currently however the public health-focused research literature provides very little insight into sex-based sociality, the social meanings of collective drug use among MSM, and its risks in relation to sexual practice and BBV/STI transmission. This gap impedes the development of effective interventions to reduce harm.

3.4 Individual-level interventions

During the past decade, there has been an ongoing effort to identify interventions to reduce drug use or sexual risk practice among MSM who use illicit stimulants. This work perpetuates a theme in the literature, identified in the previous section, of a focus upon individuals in research, rather than a focus on social-sexual contexts where risk practice occurs. The research literature that reports on RCTs of methamphetamine treatment and prevention, utilize individual-level, behavioral and cognitive interventions, namely cognitive behavioral therapy (CBT: a psychotherapeutic approach to re-organising unhealthy patterns of thinking, perceiving, and behaving), contingency management (CM: in this context, incentives in the form of small cash rewards for evidence of abstinence from drug use), motivational interviewing (MI: a method of increasing one's intrinsic motivation to change behavior), and combinations of these individual-level interventions (Lee & Rawson, 2008).

To date, there is a limited number of RCTs in this area, and much of this work has focused upon cocaine users. Where methamphetamine use is explored, the results are somewhat unclear, as participants are mostly poly-drug users (Lee & Rawson, 2008). In a systematic review of cognitive and behavioral interventions for methamphetamine dependence, Lee and Lawson (2008) reported that CBT and MI helps to increase abstinence and self-efficacy to quit, with an indication that even very brief interventions may be effective. Similarly, the review found that CM interventions, which are based on incentive

payments for methamphetamine users who return a 'clean' urine sample (i.e., positive reinforcement for proving no drug use), have demonstrated consistently reduced drug use during the intervention period. However, once the CM intervention concluded, and the reinforcement discontinued, the sustained effect of CM was reportedly less discernible at post-intervention follow-up points, and participants resumed their drug use.

In studies comparing CM and CBT, adding CBT did not seem to improve outcomes over the CM-only condition (Lee & Rawson, 2008). The efficacy of CM was questioned further in an RCT by Menza and colleagues (2010), which randomly assigned 127 methamphetamine-using MSM from Seattle to receive a 12-week CM intervention (n=70) or referral to community resources (n=57). No differences in drug use were found between groups during the trial, and at follow-up CM participants were more likely to provide urine samples containing methamphetamine than control participants (Menza et al, 2010). The authors concluded that CM is not likely to have a sustained preventative effect on methamphetamine use.

In Mimiaga and colleagues' (2008) study reported earlier, which interviewed 20 methamphetamine-using HIV-positive MSM from Boston who had acquired HIV infection in the context of using crystal methamphetamine, participants described a need for interventions to deglamorize methamphetamine use among MSM, in part by highlighting how dependent use can eventually destroy men's physical appearance. However, other research advises against adopting such an approach. For example, in a recently published article from the United States (Marsh et al, 2016), the authors reported on a study of methamphetamine users' (n=47) perceptions of other users who have appeared in anti-methamphetamine campaign images. Participants' sexual identity was not reported in this study, but the images used in the campaigns suggest the intervention was focused upon heterosexual people. The images used in the campaigns included before-and-after shots of men and women, a picture of a dirty toilet with the wording 'No one thinks they'll lose their virginity here - Meth will change that', and images of men and women picking at their skin, looking frail, vulnerable and in one ad, potentially violent (Marsh et al, 2016). Participants believed that the images used in the ads did not reflect their experiences of using methamphetamine, but rather the images represented a dysfunctional user who the participants did not personally relate to or associate with. The authors suggested that the use of inauthentic imagery can have unintended consequences. The images were overly stigmatizing and reportedly did not prompt study participants to stop their methamphetamine use or to seek help (Marsh et al, 2016).

Online and service-based resources for MSM who use illicit drugs

A range of online and service-based resources for MSM provide health information (such as 'Reshape') and details about alcohol and other drug services (such as 'Club Drug Clinic') aimed at lesbian, gay, bisexual, transgender, and intersex (LGBTI) people and MSM who use licit and illicit drugs in the United Kingdom, the United States and Australia.

From information garnered via websites, these online and service-based resources mostly utilize individual-focused interventions. For example, the Stonewall Project in San Francisco is described as 'a family of programs dedicated to providing harm reduction-

based counseling, treatment, and support services to gay men, transmen who have sex with men, and other men who have sex with men who are having issues with drugs and/or alcohol'. Some services such as Antidote in London UK, provide group-work programs for MSM 'involved in chemsex', as well as an evening drop-in centre where MSM can speak with 'experts'. The links to several of these online resources and services are below:

- <http://www.stimcheck.org.au/s-check>
- <http://www.reshapenow.org/chemsex>
- <http://clubdrugclinic.cnwl.nhs.uk/need-help/lgbt-communities/>
- <http://londonfriend.org.uk/get-support/drugsandalcohol/antidote-accessing-our-services/>
- <http://theinstituteofmany.org/index.php/home/turning-tina/>
- <http://www.stonewallsf.org/>

Apart from the S-check Clinic, there is no evidence that these services' online and in-house interventions, including 'one-to-one support', 'groups', 'peer mentoring' or information resources have been rigorously evaluated. The S-check Clinic model comprised a four-session brief intervention with psychosocial assessment, medical assessment, a medical feedback session and a psychosocial feedback session (Brener et al, 2016). The outcome measure however was not health-related but instead based on attendance at the four sessions. While interviews with S-check Clinic attendees revealed satisfaction with the service, there was no follow-up data collected regarding the Clinic's post-intervention efficacy for reducing rates of stimulant use or sexual risk behaviors. Despite the generally positive comments from participants during the evaluation, currently there is little evidence to support the efficacy of this program.

When visiting some links on the above websites, several pages were 'no longer available' (such as 'Drugfucked' run by the Terence Higgins Trust). The significance of the (currently active) sites for LGBTI people, and their links to information and support, is unknown and while most sites provided links to other LGBTI- and MSM-related information and services, without a rigorous evaluation it is currently not possible to recommend the sites as evidence-based interventions. While 'Reshape' provides active links to three LGBTI- and MSM-related sexual health and drug use articles published since 2013 in the journals *The Lancet* and *HIV Nursing*, these articles did not evaluate the information and interventions these services provide. The articles highlighted a LGBTI targeted health service (i.e., chemsex support at 56 Dean St) (Stuart & Weymann, 2015) and proposed interventions such as a smartphone app for health promotion messaging (Kirby & Thornber-Dunwell, 2014). The value of such sites may reside in their capacity to provide basic harm reduction information to interested methamphetamine (and other drug) users, to inform drug users of available treatment services, and to help sustain a sense of community among LGBTI people, including MSM who use illicit drugs, in part by providing safe spaces to discuss sex and drug use.

In an effort to move beyond individual-focused interventions, it may be instructive to highlight an innovative community-based intervention. The study conducted by Adam and

colleagues (2011) to address HIV-related stigma directed at MSM may suggest a strategy for developing an effective web-based intervention to reduce methamphetamine-related risk practice among MSM. In Adam and colleagues' study, an intervention that aimed to reduce stigma and make a HIV-positive disclosure safer and easier was developed via a community-based process involving HIV prevention workers, public health, government and researchers in Ontario, Canada. The intervention discouraged MSM from relying on disclosure to prevent HIV transmission, and encouraged men to test for HIV. Through extensive workshopping the researchers came up with the question, 'If you were rejected every time you disclosed, would you?' This question was widely disseminated throughout the local gay community and supported by the web site, hivstigma.com, to encourage participation in blog-based discussions, which were moderated by eight bloggers over five months. Almost 2000 MSM answered a pre-test survey on a popular gay dating site and 1791, a post-test evaluation (Adam et al, 2011).

Results of this study showed a statistically significant shift in attitudes and behaviors among those aware of the intervention. The findings indicated that the intervention helped to move MSM toward recognition that HIV-positive gay men face stigma in their community and that stigma reduces the likelihood of HIV disclosure (Adam et al, 2011). Such a community- and web-based intervention, despite being expensive, organizationally complex, and difficult to determine long-term effectiveness, may be worth trialing to reduce methamphetamine-related harm. Community- and web-based interventions have the potential to engage people such as MSM who are differentiated by class, region, age, serostatus and cultural background, and to impact on popular risk-related discourses that circulate within communities and influence risk decision making (Adam et al, 2011).

Summary of individual-level interventions

To date, RCTs have focused upon individual-level, behavioral and cognitive interventions such as cognitive behavioral therapy (CBT), contingency management (CM), motivational interviewing (MI), and combinations of these individual-level interventions. The results of trials using CBT, CM, MI and combinations have been mixed, but are usually described as poor to middling. While individual level interventions can in some contexts reduce sexual risk behaviors among MSM, there remains much uncertainty as to their longer-term beneficial effects.

There is no evidence of rigorous evaluation of currently existing online and primary healthcare-focused alcohol and other drug resources and services that target MSM methamphetamine users. Therefore, caution is advised in recommending the adoption of individual-level interventions based on CM, MI, or CBT, such as those presented above. Culturally appropriate, innovative, community-based, targeted interventions for treatment and prevention, which simultaneously address sex and drug risk practices among groups of MSM in sex-based social contexts, are urgently needed.

4 Recommendations

The following recommendations are consistent with the literature reviewed above regarding research into MSM who use methamphetamine. These recommendations can be used to assist in designing appropriate and innovative harm reduction strategies and for designing relevant policy.

- Viewing MSM's drug use as a collective practice, rather than solely a practice of individuals. Current harm reduction messages are often based on notions of individual responsibility and although important, individual responsibility will need augmenting with advice around risk reduction strategies in the context of collective risk practices within MSM's sex-based social networks.
- Considering and engaging with the perceived benefits of methamphetamine use (not just the risks) for sexual socializing among MSM, as is evident in the nascent research into sex-based sociality.
- Further research into the Perth/Western Australian methamphetamine-using MSM 'scenes', with a focus on local venues, private sex-party networks, and other spaces where men meet for sex while using illicit drugs.
- Research is required for the production of specific, detailed information about methamphetamine use among MSM and to inform ongoing support to prevent BBV transmission, STIs and other harms among MSM.
- A concurrent stream of work in knowledge translation is needed to assist in developing new HIV, HCV and other STI prevention strategies and to support the relevant workforces.
- Critical thinking by researchers and policy-makers to avoid problem inflation, which is the reproduction, reinforcement and legitimation of past errors, assumptions and myths about methamphetamine use among MSM.
- Considering online sexual meeting community websites (e.g., Grindr) as a starting point for community-based methamphetamine-related harm reduction interventions.
- Implementation of a HCV awareness campaign for MSM to highlight the risk of both HCV sexual transmission and transmission via the sharing of any injecting (and/or smoking) equipment. Such a strategy could also include messages about not sharing sex toys and lubricant with sexual partners of unknown BBV sero-status, including partners with an unknown HCV genotype.
- Caution in recommending widespread adoption of individual-level psychological interventions based on contingency management (CM), motivational interviewing

(MI) and cognitive behavioral therapy (CBT).

- Further research, in particular qualitative studies, to better understand the dynamics that underpin sex and drug use risk practice within sex-based sociality among Australian MSM. Effective intervention will first require an in-depth understanding of gay community norms, including MSM norms and practices of sex-based sociality.

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Appendix A

Table of select publications

1. Increasing methamphetamine use

Source and evidence type	Study type/ method	Population	Outcome measure	Finding
Degenhardt et al. (2016) Peer reviewed journal article	Cross-sectional Existing, routine data sources	Methamphetamine users in Australia	Outcome: Estimate of the number of regular and dependent methamphetamine users in Australia	Substantial increases over the past five years in the number of regular and dependent methamphetamine users. Estimated 268,000 regular and 160,000 dependent methamphetamine users in Australia between 2013 and 2014. Highest rates of methamphetamine dependence were among people aged 15-24 years.
Lee et al. (2016a) Report	Cross-sectional (longitudinal surveillance)	Gay and homosexually active men in Perth	Outcomes: HIV testing and treatment, sexual behaviors and drug use	In Perth and WA, crystal methamphetamine use remained stable between 2012 and 2016. Almost 11% of the sample reported using crystal methamphetamine and 8% reported use of amphetamine. HIV-positive men were more likely to report any drug use or injecting drug use across the study period. 15% of all men in 2016 used party drugs for sex in the previous 6 months, and 8% had engaged in group sex during or after drug use.
Lea et al. (2016) Peer reviewed journal article	Cross-sectional (longitudinal surveillance)	Gay and bisexual men in Australia	Outcome: Trends in recent and regular use of crystal ('ice') and powder ('speed') forms of methamphetamine; sexual risk practices of men using crystal methamphetamine	The use of crystal methamphetamine among MSM fluctuates however it increased between 2010 and 2014. Men who used crystal methamphetamine were more likely to have used the drug GHB, have used party drugs for sex, and to have injected drugs in the previous 6 months. Rates of crystal use and injecting were high among HIV-positive participants.
Lyons et al. (2013)	Cross-sectional	HIV-positive and HIV-negative gay men aged 40 years and older	Outcome: Factors associated with methamphetamine use	13% of the sample had used methamphetamine in the past 12 months. There were no geographical differences in use by state or territory. Use was greater among men in their 40s versus 50s and was also associated with being single, being HIV-positive and using other drugs for non-medical purposes in the past 12 months.

2. Risk associations

Source and evidence type	Study type/ method	Population	Outcome measure	Finding
Darke et al. (2008) Peer reviewed journal article	Literature review	People who use methamphetamines	-	There are a number of physical and psychological harms associated with methamphetamine use including toxicity and mortality, cardiovascular and cerebrovascular pathology, dependence, blood-borne virus transmission, psychosis, depression, suicide, anxiety and violent behavior.
Degenhardt et al. (2008) Peer reviewed journal article	Longitudinal Existing, routine data sources	People who use methamphetamines	Outcome: Methamphetamine use in Australia and trends in methamphetamine-related harm.	Data show increases in importation and local manufacture of meth/amphetamine, but population data shows that use remains low and stable. There have been increases in use among regular drug users. Use is associated with earlier initiation to injecting, greater participation in risky injecting behaviors and criminal activity.
Eu & Roth (2014) Peer reviewed journal article	Case-control study	Men who have sex with men recently diagnosed with HIV and HIV-negative men who have sex with men	Outcome: Association between methamphetamine use and HIV infection	Higher rates of methamphetamine use were found among HIV-positive men who have sex with men compared to HIV-negative men who have sex with men.
Hoenigle et al. (2016) Peer reviewed journal article	Cohort study	Men who have sex with men	Outcome: Self-reported methamphetamine use and sexual behavior	Men who engaged in more sexual risk behaviors were more likely to report recent methamphetamine use. Initiation of methamphetamine use appeared to increase sexual risk behavior among men.
Prestage et al. (2009a) Peer reviewed journal article	Cross-sectional	Men who have sex with men who engaged in group sex	Outcome: Self-reported drug use during group sex	Nearly two-thirds of men who engaged in group sex reported that they had drugs during the encounter. Use of methamphetamine was independently associated with unprotected anal intercourse with non-HIV seroconcordant partners.
Rawstorne et al. (2007) Peer reviewed journal article	Cross-sectional and cohort studies	Men who have sex with men	Outcome: Trends in crystal methamphetamine use, other drugs and participation in a range of sex-related behaviors	Compared to non-users, crystal users reported more sexual partners, looking for sex in more types of venues and were more likely to engage in unprotected anal intercourse with casual partners and in adventurous/esoteric sex. Crystal methamphetamine was independently associated with unprotected anal intercourse with casual partners.
Vu et al. (2015) Peer reviewed journal article	Systematic review and meta-analysis	Men who have sex with men	Outcome: Association between amphetamine-type stimulant use and HIV infection	Meth/amphetamine use was significantly associated with HIV infection among men who have sex with men in high-income countries.

3. Sex-based sociality

Source and evidence type	Study type/ method	Population	Outcome measure	Finding
Chartier et al. (2009) Peer-reviewed journal article	Qualitative	HIV-positive men who have sex with men who use methamphetamines	Outcome: Personal values, meaning and impact of drug use	Constructs of context, meaning and perceived impact (negative) were identified.
Green & Halkitis (2006) Peer-reviewed journal article	Qualitative	Gay and bisexual men who use crystal methamphetamine	Outcome: Contextual antecedents of methamphetamine use	Methamphetamine is used by men to negotiate sexual sociality and increase sexual pleasure. Gay men are subsequently placed at risk of HIV infection.
Hurley & Prestage (2009) Peer-reviewed journal article	Literature review	Gay men in Sydney	-	Intensive sex partying – behaviors include multiple sex partners, more unprotected anal intercourse with casual partners and more frequent drug taking. Men appear to be involved in high-risk adventurous sex practices, geared toward maximising sexual pleasure. Emergence of crystal methamphetamine has impacted the dynamics of sex partying e.g. increased bodily sensation, sharing of physical and social affects.
Weatherburn et al. (2016) Peer-reviewed journal article	Qualitative	Gay men in South London	Outcomes: Motivations and values associated with sex and illicit drugs ('chemsex')	There were two groups of reasons for combining sex and drugs: 1) Drugs provide the means by which men can have the sex they desire (e.g. increasing libido, confidence) 2) Drugs enhance the qualities of sex than men value (i.e. increased physical sensation, perception of intimacy, sexual adventure)

4. Individual-level interventions

Source and evidence type	Study type/ method	Population	Outcome measure	Finding
Carrico et al. (2014) Peer-reviewed journal article	Randomised controlled trial	Men who have sex with men who use methamphetamine recruited from a community-based 12-week contingency management program	Intervention: 5-session positive affect intervention (intervention + contingency management) with a control group (contingency management only) Outcome: Feasibility and acceptability of intervention; positive affect and engagement in recovery	Significant increases in positive affect among those in the intervention group, which increased self-awareness and led to greater engagement in the recovery process. Control group reported reductions in negative affect. These affective changes were not maintained over 6-month follow-up, and there were no effects on stimulant use or sexual risk taking behaviour.
Lee & Rawson (2008) Peer reviewed journal article	Systematic review	People who use methamphetamine	Intervention: Cognitive – behavioural and behavioural interventions for methamphetamine users Outcome: Impact of interventions of methamphetamine use	Treatment with cognitive behavioural therapy was associated with reductions in methamphetamine use and other positive outcomes over short treatment periods (2 and 4 sessions). Contingency management programs were associated with a reduction of use during the intervention, but less clear is whether this is sustained at follow-up.
Mausbach et al. (2007) Peer reviewed journal article	Randomised controlled trial	HIV-positive men who have sex with men who use methamphetamine	Intervention: Safer sex behavioural intervention (intervention) or time-equivalent diet-and-exercise attention (control) condition Outcome: Changes in safer sex behaviours over 12 months	Participants in the intervention group engaged in more protected sex acts over the time period. Self-efficacy was higher over time for the intervention group.
Menza et al. (2010) Peer reviewed journal article	Randomised controlled trial	Men who have sex with men	Intervention: Contingency management (intervention) or referral to community resources (control) Outcome: Feasibility of conducting a larger trial; behavioural outcomes; effect of contingency management on methamphetamine use	Non-concordant unprotected anal intercourse decreased for both study groups. Intervention and control participants were equally likely to provide urine samples containing methamphetamine and to report unprotected anal intercourse during the intervention. Intervention participants were more likely to provide urine samples containing methamphetamine at follow-up. During intervention and follow-up, intervention participants were more likely to report weekly or more frequent methamphetamine use.

Appendix B

Further review of studies

The following review of studies is provided for interested readers who would like to engage with further research in each topic area of the review.

1. Increasing methamphetamine use

a. Methamphetamine and injecting drug use among Western Australians

There are several periodic surveillance studies of illicit drug use within the Western Australia general population and their relevant findings are reported below. In the 'Final Report of the National Ice Taskforce', data shows that 2.9% of Western Australians over the age of 14 years had used 'ice' (aka crystal methamphetamine) in 2013, and a further 0.8% had used some other form of meth/amphetamine during 2013 (Commonwealth of Australia, 2015). Data from the Australian Needle and Syringe Program Report 2016 (where 79% of Western Australian respondents were reportedly heterosexual), shows that 56% of Western Australian respondents who had injected a drug in the previous 12-months (n=218) reported injecting daily or more, and methamphetamine was the drug last injected in the previous 12-months by 45% of respondents (Memedovic et al, 2016). Across Western Australia, the rate of methamphetamine injection increased between 2011 and 2015, reflecting a national pattern.

The Western Australia Illicit Drug Reporting System (WA IDRS, 2014)

The Western Australia Illicit Drug Reporting System (IDRS) survey, conducted by the National Alcohol and Drug Research Centre in Sydney and the National Drug Research Institute in Perth, is a longitudinal, cross-sectional snapshot of illicit drug use among people who inject drugs (PWID) at least monthly in the general Western Australian population (Fetherston & Lenton, 2015). This survey recruits a considerably smaller sample than the Perth GCPS. In 2014, most of the 98 WA IDRS participants (85%) identified as heterosexual. The findings of the 2014 survey show that the mean age of respondents was 43 years, with 60% male. The sample almost entirely spoke English (98%) and only six respondents identified as Aboriginal or Torres Strait Islander (ATSI). Most respondents (77%) were unemployed and, on average, had 10 years of schooling, and 63% reported having some post-high school education. Half reported currently being in drug treatment and just over a half reported a history of incarceration (51%). The majority of respondents in 2014 were recruited via a Needle and Syringe Program (Fetherston & Lenton, 2015).

While the IDRS sample is also quite different to the sample of MSM in the Perth GCPS, it is instructive to view the survey findings. Heroin use in all of the Australian GCPS surveys of MSM is consistently reported as being very low (e.g., 0.7% in the 2016 Perth GCPS) (Hull

et al, 2016; Lee et al, 2016a, 2016b & 2016c). However, heroin remained the primary drug of choice in the IDRS sample and heroin use was reported by 65% of respondents, with no change in these rates from the previous year's survey (Fetherston & Lenton, 2015). The IDRS distinguishes between methamphetamine powder ('speed'), methamphetamine base, and crystal methamphetamine ('ice' or 'crystal'). The findings of the IDRS show that lifetime use of any form of methamphetamine was reported by 93% of the sample and recent use (i.e., the past month) was reported by 66% of respondents. Lifetime use of speed powder was reported by 88% and recent use by 39% of respondents. Lifetime use of base or paste methamphetamine was reported by 46% and recent use by 8% of respondents and lifetime use of crystal methamphetamine was reported by 82% and recent use by 53% of respondents (Fetherston & Lenton, 2015). The rates of crystal use in the WA IDRS 2014 are considerably higher than those reported among MSM in the Perth GCPS (Lee et al, 2016a).

A search of the literature uncovered one scholarly article by Green and Moore (2013) regarding a Perth-based study of methamphetamine and other illicit drug use. The ethnographic study of 60 young (i.e., 18-31 years of age) methamphetamine users (including methamphetamine smokers) explored a tension between the normalisation of methamphetamine use within study participants' networks and the stigmatisation of methamphetamine users in the broader (Perth) community. The participants were part of the Perth-based electronic dance music scene, referred to by the authors as 'scenesters'. Participants were predominantly of Anglo-Celtic background, male (60%), heterosexual, educated and employed (Green & Moore, 2013). These data were collected from 2005 to 2007. There was no indication that MSM had participated in the research, and the study did not explore risky sexual practice and methamphetamine injection. As such, the article provides little insight into the MSM crystal using population of Perth.

b. International epidemiology of methamphetamine use

Citing data from the United Nations Office on Drugs and Crime (UNODC), Maxwell and Rutkowski (2008) reported that – globally - the largest production sources for methamphetamine are in Southeast Asia and North America, with the majority of methamphetamine users in the world residing in these areas. Southeast Asia is described as a 'global hub' for methamphetamine production and trafficking with evidence of increasing use in the Mekong region and of large-scale manufacture of the drug in Cambodia, Indonesia, Malaysia and the Philippines (McKetin et al, 2008). It is estimated that the methamphetamine 'epidemic' in Asia that started in the mid-1990s had peaked by 2000-2001 however the authors warned that production and trafficking in the Mekong region, the peninsular and the archipelago of Southeast Asia could result in increased use within these areas (McKetin et al, 2008).

Methamphetamine has become the main stimulant used in the United States although there is variation in the types of methamphetamine used (i.e., powder, base, crystal), the routes of administration, and the populations that use the drug (Maxwell & Rutkowski, 2008; Shoptaw & Reback, 2007). In the United States, one of the population groups that commonly report crystal methamphetamine use is MSM (Shoptaw & Reback, 2007), with its spread from the West Coast to the east occurring among this population during the late 1990s. By 2001, it was estimated that up to 13% of adult MSM and around 20% of young (i.e., 15-22

years) MSM reported using methamphetamine in the previous six months (cited in Shoptaw & Reback, 2007). Similarly, in Mexico and Canada from the late 1990s to the early 2000s, there has been a reported increase in the use of methamphetamine among the general population. As seen in Australia, since 2000, the purity of methamphetamine in the United States, Mexico and Canada has increased and the price has decreased, with the drug becoming the primary reason for people seeking drug treatment in the United States, and increasingly in Canada. Methamphetamine users are predominantly white, although there has been an increase in the drug's use among Hispanics in the United States (Maxwell & Rutkowski, 2008).

For some time, it has been reported that Europe has a relatively low prevalence of methamphetamine use compared with Southeast Asia and North America. In an overview of methamphetamine prevalence in Europe, Griffiths and colleagues (2008) reported that there is little evidence for significant diffusion of methamphetamine throughout European nations. The only exceptions are the Czech Republic (where the drug is known as 'Pervitin') and to a lesser extent the Slovak Republic, which both report significant methamphetamine problems. The authors suggested that other illicit drugs, such as MDMA (i.e., ecstasy), amphetamine and cocaine are more popular than methamphetamine among users in European cities, and that the popularity of these other drugs have impeded the spread of methamphetamine into drug using networks (Griffiths et al, 2008). These observations were supported by subsequent research conducted during 2011, which analysed and compared sewage urinary biomarkers of illicit drugs from 19 major European cities (Thomas et al, 2012). The results showed evidence of the highest per capita use of methamphetamine in Budweis (the Czech Republic), and also in Finland and Norway, however as the authors pointed out, these centres represent a small proportion of the total European population (Thomas et al, 2012).

The findings of a methamphetamine prevalence study in the United Kingdom suggested that use of the drug is negligible in the general British population however among gay men and other MSM the rates were reportedly 7.8% in London and 'not insubstantial' in middle/eastern England at around 3.5% (Bonell et al, 2010). Similarly, Bolding and colleagues (2006) reported that around 10% of gay men in London reported using crystal in the previous 12 months, but that most of these men used the drug infrequently, such as once or twice a year. While prevalence varied by sub-samples of men (e.g., higher among HIV-positive men), the rate of use did not change between 2003 and 2005, and gay men were more likely to have reported using cocaine, ecstasy or ketamine than methamphetamine in the previous 12 months (Bolding et al, 2006). The authors did caution however that the situation could change and that ongoing monitoring for increasing methamphetamine use, particularly among gay men, is needed.

2. Risk associations

Health risks of methamphetamine use

In a comprehensive review of the literature regarding the physical and psychological harms associated with methamphetamine use in the general population, Darke and colleagues (2008) suggested that methamphetamine use is extremely dangerous and corrosive to society and communities, and requires an urgent policy response (see Moore & Fraser,

2015 for a critique of methamphetamine-related research and policy). Critically however, this review did not provide information on methamphetamine-related harms in relation to patterns of use, such as dose and frequency of use (Moore & Fraser, 2015). This is serious limitation, as people can consume methamphetamine without experiencing any of the health problems Darke and colleagues reported. Despite this limitation, the article is instructive. The authors reported the main physical harms as mortality, cardiotoxicity, dependence, and BBV transmission. Like many illicit drug users, methamphetamine users often simultaneously combine a variety of drugs (poly-drug use) which increases the likelihood of health problems, overdose and death. Mortality among methamphetamine users is typically caused by people experiencing seizures, cardiac arrhythmias, or respiratory failure. Cardiotoxicity results from the heavy demands that methamphetamine places upon the cardiovascular system, which can lead to coronary artery disease, including chest pains, palpitations, tachycardia and hypertension. The authors continued by highlighting that methamphetamine use increases the risk of ischaemic and haemorrhagic stroke, and there is a higher associated risk of death after stroke (Darke et al, 2008).

Dependence on methamphetamine is strongly associated with injecting and smoking the drug, and the potency of the drug appears to increase dependence liability (Darke et al, 2008). The risk of BBV transmission is increased through sexual risk behavior and injecting equipment sharing. With regard to psychological impacts, methamphetamine use can potentially lead to psychosis, which is usually transient with delusions and hallucinations, and rates of depression, anxiety and suicide are reportedly substantially higher among users compared to the general population. Violent behaviors appear common in methamphetamine users, and psychosis may accompany violent behaviors (Darke et al, 2008). Despite these numerous physical and psychological harms, Degenhardt and colleagues (2008) put methamphetamine use in perspective by highlighting how overall harms, including mortality, remain substantially greater among opioid users than among methamphetamine users.

Risk practice for BBVs and STIs

In a case-control study by Eu & Roth (2014) that explored the association between methamphetamine use and recent HIV infections in Melbourne, the researchers compared methamphetamine use in MSM recently diagnosed with HIV (n=65) with methamphetamine use in HIV-negative matched MSM (n=146) controls, who were tested in the same period. The results showed that there was a significantly higher rate of methamphetamine use among participants recently diagnosed with HIV compared with HIV-negative controls (Eu & Roth, 2014). While the generalizability of the study findings was limited by the relatively small number of participants, the study cohort represented around 10% of the total number of MSM diagnosed with HIV in Victoria between 2011 and 2013.

Similarly, in Prestage and colleagues' (2009a) study of 746 Australian gay men who used drugs and reported participation in a group sex event (GSE) in the previous six months, methamphetamine use and heavy drinking (defined as more than five drinks during the GSE) were associated with high risk practices. In particular, methamphetamine use was independently associated with unprotected anal intercourse (UAI) with non-HIV seroconcordant partners in multivariate analysis (Prestage et al, 2009a). Furthermore, HIV-

negative participants from the 'Health In Men' (HIM) cohort study, which comprised mostly Sydney gay men recruited between 2001 and 2004, were associated with a markedly increased rate of HIV seroconversion if they had used methamphetamine, oral erectile dysfunction medications (OEM), and amyl nitrite together (Prestage et al, 2009b).

Analogously, Rawstorne and colleagues (2007) study of over 7500 MSM mostly from Sydney and NSW found that compared to non-users, crystal users reported a greater number of sex partners, sought sex in a larger number of venues, were more likely to use other recreational drugs, were more likely to use Viagra (i.e., an OEM), were more likely to engage in UAI with casual partners, and were more likely to engage in esoteric or adventurous sexual practices. However, the authors noted that while the prevalence of crystal use among MSM increased between 2002 and 2005, the prevalence of UAI with a casual partner, as well as other sex-related behaviors, remained stable or decreased overtime within various sub-groups included in the study. Several authors have noted that such findings suggest that crystal use per se does not necessarily drive unsafe sexual behavior (Degenhardt et al, 2010; Prestage et al, 2009b; Rawstorne et al, 2007). Rather, the factors that cause HIV risk among methamphetamine using MSM are likely to be more complex than a simple function of methamphetamine use, or drug use generally.

As Leonard and colleagues (2008) suggest, crystal methamphetamine use is one of a number of ways of increasing the range and intensity of sexual experience. Similarly, in a study of sexual behavior patterns of gay and bisexual men (n=49) who use methamphetamine and other illicit drugs in New York City, participants reported equal rates of unprotected anal insertive and receptive sexual practices, including 'extreme' sex acts, when using methamphetamine, other illicit drugs or when not using any illicit drug, with HIV-positive men reporting more risky behaviors than HIV-negative men (Halkitis et al, 2005a). While the sample size was a limitation of this study, the findings, like those of Degenhardt, Prestage, Rawstorne and their colleagues, suggest that methamphetamine attracts a hypersexual, risk-taking group of men who engage in unprotected sexual behaviors regardless of their methamphetamine use (Halkitis et al, 2005b). Following on from this study, Halkitis and colleagues (2009) conducted longitudinal modelling of methamphetamine use and sexual risk practice among gay and bisexual men, and found that methamphetamine use was related to the frequency of unprotected insertive and receptive intercourse with HIV-positive and status unknown casual partners across time, and that this association was more evident among HIV-positive participants (Halkitis et al, 2009).

In a systematic review and meta-analysis of amphetamine-type stimulants and HIV infection among MSM by Vu and colleagues (2015), the researchers looked at the relationship between ecstasy use and HIV infection compared to meth/amphetamine use and HIV infection. They reviewed case-control, cross-sectional and longitudinal studies and concluded that the 'pooled' association between meth/amphetamine use and HIV infection was statistically significant across all three designs (Vu et al, 2015). Conversely, the evidence for an association between ecstasy use and HIV infection in cross-sectional studies was described as 'lacking'. Similarly, in a systematic review of behavioral and treatment outcome studies among HIV-infected MSM who use crystal methamphetamine (Rajasingham et al, 2012), the authors reported that HIV-infected MSM who use crystal are

more likely to report high-risk sexual behaviors, STIs, and serodiscordant UAI compared to HIV-infected MSM who do not use crystal. HIV-infected MSM who used crystal also showed worse adherence to HIV medications and had poorer HIV-related health outcomes than HIV-infected MSM who did not use crystal (Rajasingham et al, 2012).

In a recent longitudinal study conducted in California between 2008 and 2014, Hoenigl and colleagues (2016) measured sexual risk behavior for HIV infection among men accessing a community-based HIV screening program. They reported that among 754 HIV-negative MSM who had used methamphetamine within the previous 12 months, scores on a sexual risk behavior scale were significantly higher compared to 5922 MSM who reported never using methamphetamine. Eighty-two repeat testers had initiated methamphetamine use between tests and were found to have higher sexual risk scores after starting their use. The findings demonstrated a clear link between commencing methamphetamine use and increasing sexual risk behavior among this cohort of HIV-negative MSM (Hoenigl et al, 2016).

Similarly, Chew Ng and colleagues (2013) analysed Californian surveillance data for MSM who were diagnosed with syphilis between 2004 and 2008, to look for differences in the average number of sex partners by methamphetamine use and internet use to find partners (the two groups were mutually exclusive). In this analysis, methamphetamine users were found to have had more sex partners than non-users (mean=11.7 vs. 5.6, $p<0.001$), as did internet users compared to non-internet users (mean=9.8 vs. 5.0, $p<0.001$). Multivariate analysis confirmed an independent association of methamphetamine and internet use with increased numbers of sex partners (Chew Ng et al, 2013). Notwithstanding the methodological limitations of previous quantitative research designs, the observed strong association between risky sexual behavior and methamphetamine use is instructive; crystal methamphetamine appears to augment MSM's sex drive and enable users to stay high for extended periods, which can increase the likelihood of multiple sexual encounters with multiple sex partners over an extended time (Mimiaga et al, 2008). While statistical tests of association cannot be ignored, they are limited in their capacity to establish causality. Despite this, MSM who use crystal/methamphetamine (and other drugs), at the least, require specific, detailed information and ongoing support to prevent BBV transmission, STIs and other harms.

In a qualitative Australian study (Saltman et al, 2008) of 16 general practitioners (GPs) who managed problematic crystal use and associated depression among gay men and HIV-positive men in Sydney, Adelaide and a rural coastal city, GPs described crystal use as a growing problem. Some GPs saw crystal use and depression as linked, particularly among heavy users, while others believed that gay men and HIV-positive men often have pre-existing depression and that the relationship between crystal use and depression is complex. Similarly, GPs described the difficulties they experienced in managing their patients' depression with antidepressant treatments when crystal use was hidden from them, or when patients simultaneously used crystal (Saltman et al, 2008). The authors recommended that GPs work to build trust with their patients so that a full and honest disclosure of drug use is made easier, and to broaden their understanding of how to anticipate and respond to problematic levels of crystal use (Saltman et al, 2008).

3. Sex-based sociality

An exploration of intimacy, sexual practice and collective drug use is found in recent publications from two Australian studies of injecting equipment sharing. The findings of an interview-based study of HCV prevention among intimate heterosexual relationships, while distinct from sex-based sociality among MSM, have provided tentative insights into injecting equipment sharing (Fraser et al, 2014). This study, which collected data about the dynamics of injecting within 40 heterosexual partnerships, found that love and intimacy shaped and influenced injecting practice. Couples co-created meaningful practices of ‘care’ and ‘safety’ in response to specific risk contexts rather than in adherence to strict biomedical understandings of viral safety. On occasion, participants prioritized social wellbeing over biological risk, with the protective effects of relationship intimacy displacing the more-narrow concerns of viral risk (Fraser et al, 2014). The study’s interview method elicited detailed accounts of injecting equipment sharing, which highlighted respondents’ everyday concerns and understandings of risk and safety. The findings offered practical guidance for health promotion aimed at couples, such as Fitpaks designed for intimate partners, to reduce HCV-related risk, which move beyond individualistic risk-reduction approaches to consider the role of social and cultural environment.

While findings from Fraser and colleagues’ (2014) study of heterosexual couples in regular relationships are instructive, it is likely that MSM who inject drugs with partners in various sexual contexts have different patterns of sharing, and different understandings and meanings of risk and relationships (as the heterosexuals were typically monogamous), particularly as these contexts may involve small or large groups, as well as regular or casual partners. In addition, a study by Hopwood and colleagues (2015b) pointed to substantial gaps in knowledge about HCV-related risk practice among gay and bisexual men. For gay and bisexual men already living with HCV, 46% of men wanted more information on preventing the sexual transmission of HCV and a majority of respondents (56%) did not know that HIV-positive men are more vulnerable to HCV than HIV-negative men (Hopwood et al, 2015b). However, the findings of this survey, like so much research in this area to date, were unable to provide detailed accounts of the patterns, contexts and motivations for sharing injecting equipment among gay and bisexual men, and the forms of sex-based sociality that carry the greatest BBV- and STI-related risks.

4. Individual-level interventions

In a small pilot RCT (n=21) by Carrico and colleagues (2015), that targeted positive affect regulation in methamphetamine using MSM through a multi-component, individually delivered, five-session intervention (named ‘Affect Regulation Treatment to Enhance Methamphetamine Intervention Success [ARTEMIS]’), which was adapted from prior clinical research, participants were randomised to receive ARTEMIS+CM (n=12) or CM-only (n=9). Those receiving the ARTEMIS+CM reported slight increases in positive affect over the five sessions, and the CM-only group reported significant reductions in negative affect over a two-month follow-up (Carrico et al, 2015). Importantly, there were no concurrent effects on stimulant use or sexual risk taking over the six-month follow-up for either intervention group (Carrico et al, 2015).

Even interventions termed 'community-based', and aimed at methamphetamine-using MSM, have relied upon individual-level approaches such as CBT and CM delivered through clinical settings with a harm reduction focus. For example, Carrico and colleagues (2014) reported that in their study of 211 MSM, participants reduced their drug use and concomitant sexual risk-taking behavior while participating in the harm reduction interventions. Unfortunately, reductions in drug use and risk behaviors were not sustained during the six month follow-up. Despite this, the authors reported that their findings provide preliminary support for the potential benefits of treatment using a harm reduction focus to assist individuals with reducing stimulant use and minimizing its potential negative consequences (Carrico et al, 2014; Carrico et al, 2015).

Similarly, Wilkerson and colleagues (2015) surveyed an online sample of 284 MSM of various ethnicity, age and level of 'outness' (i.e., openly identifying as an MSM) from the United States who had injected methamphetamine in the previous 30 days. Their findings suggested that MSM participants had heard public health harm reduction messages about avoiding sharing needles, using bleach to clean needles and injecting equipment, avoiding condomless anal intercourse when using drugs, and using extra lubricant when having condomless anal intercourse. Most men (53%) had combined these sexual and substance-use harm reduction strategies and integrated them into their behavioral scripts (Wilkerson et al, 2015). The findings suggest that public health harm reduction messages that are individually tailored for specific sub-groups can influence risk practice.

In a quasi-experimental study comparing safer sex behaviors among HIV-positive, methamphetamine-using MSM, 341 participants from California were randomly assigned to receive either a safer sex behavioral intervention named EDGE, comprising five-weekly individual counseling sessions of 90-minutes duration followed by three monthly booster sessions, or a time-equivalent diet and exercise attention-control condition (Mausbach et al, 2007). As described in the article, the EDGE intervention 'used skills-training to help participants increase their knowledge, self-efficacy, and positive outcome expectancies in relation to a number of critical areas such as condom use, negotiation of safer sex practices (including sexual assertiveness), and disclosure of HIV serostatus to sex partners. The mechanisms of behavioral change involved observation, role modeling, skill performance (i.e., practice and rehearsal), positive feedback, reinforcement, and the development of supportive referents' (Mausbach et al, 2007: page 5 of Authors' manuscript). EDGE participants reported significantly more protected sex at both eight months and 12-month follow-up, and by 12-months post baseline, EDGE participants reported more protected sex compared to the diet and exercise group (25.8% vs. 18.7%, $p < 0.038$). Furthermore, the authors reported a significant time-by-intervention interaction ($p = 0.018$) for self-efficacy for condom use (part of the EDGE counseling), which indicated that EDGE participants' self-efficacy increased overtime compared to the control group participants. The authors concluded that intervening can reduce high risk sexual behaviors among methamphetamine-using HIV-positive MSM through increasing self-efficacy instead of reducing drug use (Mausbach et al, 2007).

In a systematic review and meta-analysis of barriers to accessing treatment for methamphetamine use (Cumming et al, 2016), the most commonly reported barriers

identified in the limited literature that is currently available from five countries (i.e., Australia, the United States, the United Kingdom, China and South Africa) were described as psychosocial, but other practical and service-related barriers, such as an insufficient capacity to meet treatment demands were also evident. The psychosocial barriers to treatment were: the perception that one's own drug use did not require treatment; embarrassment or stigma associated with drug use; participants preferring to withdraw on their own; and, concerns about privacy (Cumming et al, 2016). The authors concluded by reporting that while barriers to treatment for methamphetamine use have been identified, interventions and treatment models that target these barriers are urgently required to fulfil a growing demand.

In recent years, biomedical prevention of HIV has become more salient among HIV-negative gay and other MSM as strategies such as post-exposure prophylaxis (PEP) and more recently pre-exposure prophylaxis (PrEP) are adopted by MSM. PrEP is used by MSM for prevention of HIV infection. Some HIV-negative men may use PrEP to have condomless sex in the context of drug use. While PrEP has shown favorable results for HIV prevention in clinical trials and in 'real world' trials (McCormack et al, 2016), increases in antimicrobial resistance for gonorrhoea and increasing rates of syphilis among MSM provide further challenges to both the control of STIs and the ongoing prevention of HIV infection (Scott & Klausner, 2016). Unfortunately, at the time of writing, there is no indication in the academic databases of published studies of PrEP use in relation to methamphetamine and sexual risk practice (this observation was confirmed through personal communication with Associate Professor Martin Holt, who heads the Australian Gay Community Periodic Surveys). As such, it is likely that future studies will examine the health-related outcomes of combining PrEP and methamphetamine, such as the effect on rates of STIs.

Appendix C

Further recommendations for health promotion

A recent review of Australian resources produced to support HCV prevention efforts is also relevant to examine (Winter et al, 2012; 2013). This review included more than 200 items (brochures, posters etc.) produced between 1990 and 2010. Overall, the results of this review indicate that the social aspect of injecting drug use was rarely visible within the resources, with most portraying injecting drug use as an individual activity. The authors suggested that effective resources were those which were authentic (representing the experience of drug use, as would be recognizable and relatable by the intended audience) and which reflected diverse settings and circumstances (specifically taking account of the social nature of injecting drug use and the relationships between those involved). These findings can be used to critique fear-based or sensationalist campaigns that do not reflect the experience of people already using the drug or those that are unattractive to the target group through the use of stigmatizing portrayals.

Acknowledge that responsibility for prevention is shared.

- Avoid blame, stereotypes and stigma
- Portray HCV prevention as a responsibility that is shared by organisations, society, government and people who inject drugs
- Position people who inject as partners in HCV prevention rather than 'targets' of it

Consider the restrictions of the local environment.

- Provide realistic and achievable advice
- Avoid unachievable suggestions – this will undermine the credibility and usefulness of the resource and create conditions for blame

Repackage health promotion messages etc. for specific target groups.

- Specify target groups
- Package health promotion to reflect interests and needs of target group (e.g. use relevant social categories rather than epidemiological risk categories)

Contextualise HCV prevention within the diversity of injectors' experiences.

- Package HCV information with new and useful information that engages with people's lives
- Consider whether the content and approach are relevant only to some lives

Address injecting in groups.

- Avoid presenting information that speaks only to the individual and ignores the social context of injecting
- Avoid advice that assumes injecting alone is ideal and achievable
- Ensure input from a number of sources, particularly the target group.
- Peer involvement is essential
- But there is also need to draw on social research and broader health communication literature

Indicate currency and timeliness of information.

- Date all resources clearly
- Include a recommendation of a “review by” date to ensure timeliness
- Include caveats indicating that information is subject to change

Use plain language and avoiding jargon.

- Use simple, non-technical language to avoid confusion
- But also avoid turning to stereotypes or clichés

Use conditional rather than absolute language.

- Facilitate thoughtful engagement with the material use terms such as “possible”, “typically” rather than directives such as “never” or “always”

Ensure an evaluation strategy is in place.

- Evaluate distribution and uptake, as well as perceived value and use
- Focus test resources with members of the target audience
- Recognise that health promotion resources can be worse than ineffective, they can reproduce stigma and stereotypes
- Use testing to examine reader interpretations