

The global epidemiology of methamphetamine injection:

**A review of the evidence on use
and associations with HIV and other harm**

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on behalf of the Reference Group to the United Nations
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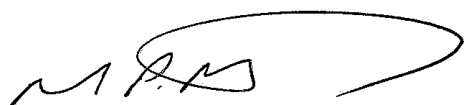
Foreword

In more and more countries around the world, amphetamine type stimulants and methamphetamine in particular are the focus of mounting concern. More people appear to be using methamphetamine and there are fears that this could contribute to increased transmission of HIV.

Answers are needed to critical questions: People who inject drugs are exposed to the risk of HIV infection – but does the injection of methamphetamine put them at an even greater risk? Is the risk of sexual transmission greater for those using methamphetamine? What steps can be taken to curtail use and reduce harms?

This paper represents an important first step in examining methamphetamine on a global level. The relationship between HIV and methamphetamine use is explored within the context of global diversity. While summarising the evidence currently available the authors make clear that much of the picture remains incomplete. Further investigation is urgently required before we can fully understand the extent of methamphetamine use in most countries and the nature and magnitude of related harms.

As director of the Secretariat of the Reference Group to the United Nations on HIV and Injecting Drug Use, it is my pleasure to present this report which is the first in a series of thematic papers produced on behalf of the Reference Group in 2007. The thematic paper series addresses issues of current concern relating to injecting drug use and HIV and supplements the two annual reports of the Reference Group which describe the global epidemiology of injecting drug use and HIV prevention and care services.



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Background to this report

At the request of Member States and on behalf of all UNAIDS cosponsors, the United Nations Office on Drugs and Crime convened a meeting of international experts in Vienna, 9-10 March 2006, on "Methamphetamine use: health consequences, particularly HIV/AIDS, and treatment".

There was consensus among the experts attending this meeting that currently "there are insufficient data to support a conclusion that there is a specific link between methamphetamine use and increased HIV risk compared to other drug users, except in very specific geographical locations and specific groups".

In response, the Steering Committee of the Reference Group to the United Nations on HIV and Injecting Drug Use agreed to examine further the links between methamphetamine injection and HIV. This report is a product of this research.

Abbreviations

ART	antiretroviral treatment
ARV	antiretroviral
ATS	amphetamine type stimulants
BBVI	blood borne viral infections
GLBT	gay, lesbian, bisexual and transgender
HAART	highly active antiretroviral therapy
HBV	Hepatitis B Virus
HCV	Hepatitis C Virus
HIV	human immunodeficiency virus
ICD-10	International Classification of Diseases, 10th revision
IDU	injecting drug use or injecting drug user
LSD	<i>d</i> -lysergic acid
MA	methamphetamine
MDMA	3,4-methylenedioxymethamphetamine
MSM	men who have sex with men
NDARC	National Drug and Alcohol Research Centre
NSP	needle and syringe programme
PMA	para-methoxyamphetamine
STI	sexually transmitted infection
UAIC	unprotected anal intercourse
UNAIDS	Joint United Nations Programme on HIV/AIDS
UN	United Nations
UNODC	United Nations Office on Drugs and Crime
UNSW	University of New South Wales
WHO	World Health Organization

Executive summary

Amphetamine type stimulants (ATS) have recently become the focus of increasing attention worldwide because of a substantial increase in the production of these drugs over the past decade, and increasing consumption and harm related to their use. Many more people are estimated to use ATS than opioids or cocaine but there are far fewer people using ATS than cannabis. There has been understandable concern about associations between ATS use and human immunodeficiency virus (HIV) risk much of which, particularly in North America, has focused on risky sexual behaviour.

The term “amphetamine type stimulants” refers to a range of drugs related to amphetamine which share stimulant properties that increase the activity of the central nervous system and produce effects similar to adrenalin. Methamphetamine and amphetamine are now the major ATS available worldwide. In this report, we use the term “meth/amphetamine” as a general term, given the varying forms of the drug often used, the fact that most users are not aware of the difference, and the general applicability of research findings to both. Meth/amphetamine is most commonly taken orally, intranasally, the vapours inhaled (smoking) or by injection.

The present paper summarises the existing peer reviewed and “grey” literature on the epidemiology of use and injection, and the prevalence of HIV and Hepatitis C Virus (HCV) among meth/amphetamine users. We also summarise evidence on the extent and nature of the risks and consequences of meth/amphetamine use

A meth/amphetamine dependence syndrome is well described. Dependence has been associated with mental health, physical, occupational, relationship, financial and legal problems. It is likely that most of the harm related to meth/amphetamine use occurs among those who have developed dependent use of the drug.

Epidemiology of use and associations with HIV

Meth/amphetamine use appears to be increasing in many parts of the world, but many countries have scant or no data on the prevalence, routes and forms of meth/amphetamine use. On the basis of the evidence reviewed in this report, problematic meth/amphetamine use appears more prevalent in East and South East Asia, North America, South Africa, New

Zealand, Australia and a number of European countries; use of meth/amphetamine appears to be currently less common in Central and South Asia, Latin America and the Caribbean, the Pacific, North Africa, some countries in Sub-Saharan Africa and the Middle East.

The prevalence of HIV and HCV among meth/amphetamine injecting drug users (IDUs) is poorly documented in almost every country, with data on meth/amphetamine injecting risk generally scant. Meth/amphetamine injectors and users are often younger than opioid users, so different strategies for targeting this group may be required. Some studies have suggested an increased likelihood of injecting risk and HIV seroconversion among meth/amphetamine injectors compared to injectors of other substances, others have not. More comprehensive data and research on this issue are needed.

Perhaps not surprisingly, given their younger age and the context of meth/amphetamine use for some users, high risk sexual behaviours have been documented as more common among this group. This provides an additional avenue through which HIV and other sexually transmitted infections (STIs) may be transmitted, and may be important where HIV transmission is occurring primarily through sexual contact and particularly among men who have sex with men (MSM). Research findings on the association between sexual risk and meth/amphetamine use are mixed, suggesting this is a complex issue that requires further investigation.

Other harms associated with meth/amphetamine use

A range of adverse consequences have been associated with meth/amphetamine use in addition to associations with HIV and STI infection. Among the acute physical effects are sweating, heart palpitations, headaches, tremors, and increases in body temperature^{1 2}. Adverse psychological side effects include restlessness, anxiety, dizziness, irritation, confusion and aggression. Cardiovascular toxicity and cerebrovascular toxicity can also occur.

Those who use the drug heavily over a period of time face the attendant risks of developing dependent use. There are also risks of meth/amphetamine induced psychosis, associations with violence and aggressive behaviour.

Problematic use tends to be concentrated within high risk groups in many countries; population prevalence estimates of past year use, derived from household survey methodologies, are therefore of limited usefulness for providing information about the extent to which meth/amphetamine use is causing harm in a given country.

Better monitoring of use, risks and harm among known at-risk populations is required. Most of what little we currently know about the associations between meth/amphetamine use and harm is dominated by research from higher income countries; how applicable this knowledge is to low and middle income countries is uncertain. Future work must address this gap, and we list some of the possible research areas later.

The importance of form and route of administration

Available data strongly suggest that both route of administration and form of meth/amphetamine are important factors affecting the nature and extent of associated harms. Given the limited data available, however, it is difficult to tease apart the relative contribution of these two factors and further work is needed. Other factors (such as dose) may also be important.

Although the focus of this report is on the injection of meth/amphetamine, ‘smoking’ is an important route of administration in countries where crystal methamphetamine is known to be available and is likely to be a problem (for example in Thailand, Australia and the United States). There is evidence that “smoking” crystal methamphetamine also carries particular risks and that there is an association between ‘smoking’ or ‘injecting’ crystal methamphetamine and elevated risk of dependence.

Although it is unclear to what extent crystal methamphetamine users who are ‘smoking’ the drug will make the transition to injecting, this transition may be more likely in countries where there is already an established population of injecting drug users (IDUs), and where access to smoking equipment is banned. It would be prudent to focus attention on countries where smoking methamphetamine is common, where dependent use has emerged, and where injecting of other drugs is becoming more prevalent (for example in South East Asia).

Possible responses

Supply reduction

Precursor control

In many, if not most, countries the first response to increased availability of meth/amphetamine by governments seems to be consideration of changes in the scheduling of precursors for its manufacture. The impact of domestic scheduling changes upon meth/amphetamine related harms has been evaluated in the United States with some evidence of a reduction following increased restrictions. Restrictions upon availability in one country often lead to a shift by manufacturers to obtaining precursor chemicals from alternative sources. For example, the effects of this change in the US have not been sustained, given that production increased in Mexico as a consequence of the US restrictions on precursors. Attempts to control supply may limit supply but are unlikely to significantly reduce availability or use as long as demand for the drug continues to be strong. Harm and demand reduction must play an important role in any attempts to address use and harm.

Laws related to drug possession or supply

There are little available data regarding the impact of changing laws surrounding penalties for possession of small quantities of meth/amphetamine. It is unlikely that increases in the severity of penalties for *possession* of meth/amphetamine will substantially reduce consumption (based upon prior studies examining cannabis use). There is a risk that such measures may further disadvantage users who are detected by police and who are likely to already be experiencing problems related to their drug use.

Demand reduction

Treatment of meth/amphetamine dependence

The successful treatment of drug dependence and reduced drug use are associated with a concomitant reduction in HIV risk and sexual risk behaviours. In addition treatment of drug dependence may improve access and adherence to HIV treatment for those requiring it.

A wide range of interventions have been examined for the treatment of meth/amphetamine dependence. At present there is no strong evidence of the effectiveness of agonist pharmacotherapies for meth/amphetamine dependence, and interest among

meth/amphetamine users in current medications may be limited. The drugs used to date may be effective among a select group of people, and may be best used as an *adjunct* to psychosocial interventions rather than being a primary component of treatment. The potential use and benefits of agonist-pharmacotherapies warrant further investigation.

Some evidence exists that behavioural interventions are effective in the treatment of meth/amphetamine dependence. The approaches that appear to have the greatest promise include cognitive behavioural therapy and contingency management. Treatment manuals and guidelines for general practitioners have been developed and such resources should be promoted to service providers as they represent the synthesis of current evidence in this area.

Community education

In many countries so-called “fear campaigns” have been developed in response to meth/amphetamine and other drug use. The evidence for the effectiveness of such approaches is poor. Factually based and balanced messages are preferable, will be less stigmatising, and will avoid the tendency for messages to be accurately identified as biased or exaggerated by those with knowledge of the drug concerned.

Harm reduction

Injecting related harm reduction

Needle and syringe programmes (NSPs) have been shown to reduce HIV transmission and injecting risk behaviour. Current NSP models in countries where they have been established for some time appear to be less effective at engaging certain populations of IDUs, including meth/amphetamine IDUs. These users are unlikely to attend regularly such services, and are more likely to obtain multiple needles at a given visit, reducing the opportunities for engagement.

Investigation of alternative methods of service delivery including a greater emphasis upon peer models of engagement, and delivery of non drug-related harm reduction strategies might allow for both sex and injecting risks to be addressed. In countries where Internet access is high, delivery of brief interventions and harm reduction information electronically may provide some benefits to those unwilling to present to traditional drug treatment services.

Harm reduction strategies should be aimed at preventing the uptake of injecting as well as encouraging current IDUs who are unwilling or unable to stop to use non-injecting routes of administration. Recent evidence suggests that both frequency of injection *and* injecting risk are reduced if there is greater access to smoking equipment. Outlawing smoking equipment may have a negative impact upon this group by increasing the occurrence of injecting and consequently the risk of blood borne viral infection (BBVI). Provision of smoking equipment through NSPs should be considered as an additional harm reduction measure.

The risks of “smoking” crystal methamphetamine should be communicated to users in a balanced manner. The involvement of peers (i.e. other users) in the design and delivery of these messages is recommended.

Sexual risk reduction

High risk sexual behaviours are more common among meth/amphetamine users and constitute a further potential route of HIV transmission. It is not clear yet whether this link is predominantly causal or just an association. Interventions have been developed (largely in the United States) to reduce sexual risk behaviours with individual, community outreach, peer level, family and structural approaches. The authors of a recent review concluded that there are many areas in which research is still needed, *particularly* in resource-poor settings. Notwithstanding such gaps, there is a clear public health imperative to introduce programmes to reduce sexual risk behaviour including provision of condoms and accurate information as well as voluntary HIV counselling and testing.

Interventions to address HIV among meth/amphetamine IDUs

Interventions to address HIV among meth/amphetamine IDUs should be consistent with the Joint United Nations Programme on HIV/AIDS (UNAIDS) *Comprehensive Package* for prevention and care of IDUs. Integrated service provision should be a focus of both policy and treatment for those working with meth/amphetamine IDUs and those working in the HIV sector.

HIV treatment

Highly active antiretroviral therapy (HAART) should be available to meth/amphetamine users living with HIV. In low and middle income countries, access to such treatment is especially difficult and access to effective treatment for HIV is not universally accessible for persons with HIV, which includes those who are meth/amphetamine dependent. It is very likely that people who are HIV positive and are also meth/amphetamine dependent are less likely to receive HAART than those who are not meth/amphetamine dependent.

HIV positive persons who are also meth/amphetamine dependent should be encouraged to address their drug use, and offered help to reduce their drug consumption or become abstinent. Those actively using drugs should be offered treatment for HIV and clinicians should provide support to assist patients with adhering to medication.

Current World Health Organization (WHO) guidelines state that current meth/amphetamine users should receive HAART but should *not* be prescribed ritonavir or lopinavir/ritonavir. Further research investigating potential interactions between meth/amphetamine and antiretroviral (ARV) medication is needed.

Future research

There must be a concerted investment in research across all domains considered in this report. This research should be conducted in varying countries and particularly focused upon low and middle income countries where little is known, but use appears to be high. Research areas include but are not limited to (not in order of importance):

- Collection of routine data on the route, form, frequency and quantities of meth/amphetamine use among users across countries.
- Studies of HCV and HIV risk among meth/amphetamine injectors.
- Better estimates of the population prevalence of dependence.
- Studies of the natural history of meth/amphetamine use and dependence.
- Careful research across countries and populations on the association of meth/amphetamine use with sexual risk behaviours.
- Studies of the motivations and functions of meth/amphetamine use across countries.
- Studies of the risks of meth/amphetamine induced psychosis and possible gene-environment interactions.
- Prospective studies examining the magnitude and nature of risks of HIV and HCV infection faced by meth/amphetamine users/injectors across countries where the context of use and background prevalence of HCV and HIV differ.
- Studies of the impact of HAART on injecting risk behaviours among IDUs.
- Studies of possible meth/amphetamine-ARV interactions.
- Research into interventions to address meth/amphetamine dependence, including concerted efforts to develop effective and attractive pharmacotherapies.
- Research on methods of addressing sexual risk behaviours among heterosexual meth/amphetamine users in low and middle income countries.
- Examination of better models of service delivery for meth/amphetamine users – both harm and demand reduction services.
- In countries where Internet access is high, research into the use of the Internet to deliver brief interventions and harm reduction information.

Conclusions

Problematic meth/amphetamine use appears more prevalent in East and South East Asia, North America, Mexico, some European countries, South Africa, New Zealand and Australia. Good epidemiological data on the extent of the problem are disappointingly scarce. Ongoing monitoring of drug use among at-risk groups must occur, with a focus on form, route of administration, frequency and amounts used.

Both injecting *and* smoking pose a particular risk for meth/amphetamine dependence, and those who begin smoking the drug may switch to injecting after some time. The evidence on injecting risk behaviours was inconsistent. This review was unable to document the prevalence of HIV and HCV among meth/amphetamine users in most countries; some studies found a lower prevalence than for other groups of IDUs, but the evidence is far from conclusive. Much more work must be done in this area.

There must be a strategic and concerted drive towards completion of research on meth/amphetamine use, injection, dependence and the association with HIV. It is a much more widely used drug than heroin, yet the body of evidence on the issue is comparatively limited. There must be research conducted in low and middle income countries where use is more recently increasing, the context of use is likely to differ compared to high income countries, and where HIV transmission may be a particularly high risk for users.

Based on the existing data, sexual risk behaviours appear more common among this group, which poses risks for HIV and other STI transmission. Overly simplistic conceptions of the association between sexual risk and meth/amphetamine use are unhelpful as there are multiple factors that may account for the relationship. These issues require further attention.

Better strategies for engaging meth/amphetamine users with drug treatment and harm reduction services are needed. HIV treatment should be provided to HIV positive users, with appropriate handling of risks for drug interactions. More research is needed on effective treatments, but particularly into more attractive service models of consumer engagement.

A considerable investment should be made in research across countries to examine the context, risk and harm associated with meth/amphetamine use and injection, and effective interventions to reduce the attendant problems.

1. Introduction

Amphetamine type stimulants (ATS) have become the focus of increasing attention worldwide^{3 4} because of a substantial increase in the production of these drugs over the past decade, and increasing consumption and harm related to their use, particularly dependence and “drug-induced” psychotic episodes³⁻⁵.

There has also been understandable concern about whether associations between ATS use and HIV risk are causal⁵⁻¹⁶. The debate about this possibility – heavily concentrated in North America – has focused largely upon risky sexual behaviour, namely unprotected anal intercourse (UAIC), among men who have sex with men (MSM)^{7 11 18-21}.

To our knowledge, there has been no review of the global epidemiology of ATS use, injection, and HIV prevalence. Most global reviews of illicit drug use have placed greater focus upon the injection of opioids. In the present report, we review the existing literature (peer reviewed and grey) on the epidemiology of use and injection across the globe, and the prevalence of HIV and HCV among usersⁱ. We also summarise evidence on the extent and nature of the risks and consequences of use.

1.1. What are amphetamine type stimulants?

The term “amphetamine type stimulants” refers to a range of drugs related to amphetamine, and which share stimulant properties that act to increase the activity of the central nervous system and produce effects similar to adrenalin¹⁷. Methamphetamine and amphetamine are the major ATS available worldwide, followed by 3,4-methylenedioxymethamphetamine (MDMA, or “ecstasy” as it is commonly known)³. The diversion of prescription stimulant drugs such as dexamphetamine^{18 19} has been reported, but this is less of a problem than illicitly produced ATS.

ⁱ The methods with which we searched the literature and data are summarised in Appendix A.

Amphetamine and **methamphetamine** are closely related (methamphetamine is an amine derivative of amphetamine). Both increase the release of dopamine, noradrenalin, adrenaline and serotonin^{17 20}. Both stimulate the central nervous system, and have a range of effects including increased energy, feelings of euphoria, decreased appetite, and elevated blood pressure, heart rate, and other physiological functions. Methamphetamine has greater central (versus peripheral) actions and stronger subjective effects than amphetamine²¹. Meth/amphetamine can come in pill, powder or crystalline forms; these different forms are likely to vary in purity (with the crystalline form typically of the highest purity) and can be taken through different routes. For example, pill forms are most typically swallowed, whereas the crystalline form is amenable to being smoked (the vapours inhaled) and injected (see Section 1.2). In this report, we use the term “meth/amphetamine” as a general term, given the varying drugs often used, the fact that most users are not aware of the difference, and the general applicability of research findings to both.

3,4-methylenedioxymethamphetamine (MDMA) – commonly known as “ecstasy” – also acts predominantly on the cardiovascular and central nervous systems; it has both stimulant and hallucinogenic effects^{17 22}. It has relatively greater euphoric and hallucinogenic effects compared to meth/amphetamine. Ecstasy is sometimes referred to as an “entactogen”, a reference to the feelings of empathy, closeness and sociability that many users report²³.

Many of the tablets sold as ecstasy worldwide either do not contain MDMA, or they contain a variety of amphetamine and derivative drugs^{3 24}. One of these is **para-methoxyamphetamine (PMA)**²⁵. Its effects are similar to those of MDMA, with its hallucinogenic effects similar in strength to those of *d*-lysergic acid (LSD)²⁵. PMA is thought to be much more potent and far more toxic than MDMA, with case reports of fatal intoxication at comparatively low blood levels of the drug²⁶⁻²⁹. Some evidence suggests that PMA may largely be found as an adulterant of the methamphetamine production process, rather than a desired product²⁵.

Ephedrine is derived from the *Ephedra* plant. In large doses it is a potent central nervous system stimulant, affecting the cardiovascular and respiratory systems²⁵. It was used widely for the treatment of asthma during the last century, so much so that there were concerns about potential shortages of the drug, which prompted research on the drug’s synthesis (amphetamine was later synthesised)²⁵. Last century, ephedrine use was documented widely in Japan and the Philippines; in the United States it increased in use in the 1990s as a supplement in weight control products²⁵. Ephedrine sales increased dramatically during the 1990s in the United States when it was used as a precursor for methamphetamine production.

In some countries (such as Australia and the United States), **pseudoephedrine** has become one of the major precursor chemicals used in domestic manufacture of methamphetamine, which has led to several attempts at regulating supply of medications that contain this drug³⁰⁻³². China is a major source of both ephedrine and pseudoephedrine.

In the current review, we will focus upon meth/amphetamine use, injection and harm. This choice should not be taken to imply that there is no harm related to the use of other ATS. Our focus is for several reasons: 1) they are the major ATS available and used worldwide³; 2) injection of any drug is much more likely among dependent users, but the patterns of ecstasy use are such that dependence rarely develops (debate about the nature and validity of an MDMA dependence syndrome continues³³⁻³⁵); and 3) the injection of ecstasy is uncommon even among regular ecstasy users, who are more likely to be injecting meth/amphetamine than ecstasy^{36,37}.

1.2. Routes of administration

Meth/amphetamine is usually taken orally, intranasally (“snorted”), via the vapours inhaled (“smoked”), or injection. Other uncommon routes of administration include inserting the substance rectally (“shafting”) or vaginally (“shelving”). The route of administration differs across types of meth/amphetamine. Many users smoke crystal methamphetamine, whereas meth/amphetamine pills are more likely to be swallowed, and the powder form is more commonly swallowed, snorted or injected. The dominant route of administration of meth/amphetamine in a country is probably affected by motivations for use (e.g. use by occupational groups versus recreational purposes), the existence of established groups of injecting drug users, and the type of meth/amphetamine that is available.

Both laboratory and survey research has found that injection provides greater bioavailabilityⁱⁱ, faster speed of onset and higher peak of effects than snorting or swallowing: such characteristics are related to dependence potential³⁸. Smoking also has very good bioavailability. With a greater speed of onset of effects, and a stronger “high” than snorting or swallowing, the effects are comparable to injecting³⁹⁻⁴¹.

ⁱⁱ *Bioavailability* refers to the proportion of an administered dose of a substance that reaches the circulation system in its active form.

The prevalence of injecting among meth/amphetamine users varies (see Section 4). Route of administration is also not static: some users who begin using meth/amphetamine through other routes switch to injecting after some time. In one Australian study, 40% of users had moved from non-injecting to injecting, typically in search of the increased “rush” they thought they might get, or because it was seen as more economical; few users (9%) transitioned away from injecting once they had begun⁴².

Those who make the transition from smoking to injecting meth/amphetamine are likely to have been developing dependent use⁴³. This has been documented among heroin users in China⁴⁴, the United States⁴⁵ and Australia⁴⁶. As meth/amphetamine smoking becomes more established in some populations, the risks of transition to injection among users may increase, particularly if injection is seen within peer networks as an acceptable route of administration^{45 46}. This is a significant risk that needs to be considered in countries where meth/amphetamine injecting is still uncommon, but where meth/amphetamine smoking is an entrenched behaviour.

Route of administration is important. As will be outlined in this report, injection places users at risk of contracting BBVIs and other injection problems resulting from unhygienic injection practices. Because of the high bioavailability and high peak of effects, injecting and smoking may increase the risk of adverse consequences, especially developing and/or maintaining severe meth/amphetamine dependence³⁸.

1.3. Meth/amphetamine dependence

Dependence involves a cluster of symptoms that include tolerance to a drug’s effects and impaired control over drug use, with continued use in the face of recurrent problems that the user knows (or believes) to be caused by their drug use⁴⁷. Dependent users often continue to use the drug to avoid withdrawal symptoms. The core International Classification of Diseases, 10th revision (ICD-10) drug dependence criteria are listed below (Table 1).

There is good evidence of a meth/amphetamine dependence syndrome⁴⁸⁻⁵⁰. The development of meth/amphetamine dependence typically occurs after a period of sustained regular use. Daily use is particularly risky^{51 52}, but weekly users are still at risk of developing dependence⁵³. The meth/amphetamine withdrawal symptoms include craving the drug, fatigue, psychological distress (irritability, depression, anxiety, disturbed sleep, and problems with concentration) and physical problems that may include sweating, decreased appetite, and body aches⁴⁹. Dependence has been associated with mental health, physical, occupational, relationship, financial and legal problems⁵⁴⁻⁵⁹.

Table 1: Criteria for past year ICD-10 drug dependence

<p>Three or more of the following have been present together at some time during the previous year:</p> <ul style="list-style-type: none">• A strong desire or sense of compulsion to take the substance;• difficulties in controlling drug use in terms of its onset, termination, or levels of use;• a physiological withdrawal state when substance use has ceased or has been reduced, as evidenced by: the characteristic withdrawal syndrome for the substance; or use of the same (or closely related) substance with the intention of relieving or avoiding withdrawal symptoms;• evidence of tolerance, such that increased doses of the psychoactive substance are required in order to achieve effects originally produced by lower doses;• progressive neglect of alternative pleasures or interests because of psychoactive substance use, increased amount of time necessary to obtain or take the substance or to recover from its effects; and• continued use despite clear evidence of overtly harmful consequences.
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Source: World Health Organization⁶⁰

1.3.1. Risk factors

Some users are at greater risk of developing dependent use once they begin. Dependence risk may differ across countries, although no studies have yet directly compared the epidemiology of meth/amphetamine dependence cross-nationally. Factors include structural determinants (high unemployment, poverty etc.), social and cultural factors, and individual characteristics. Users with a history of other drug and mental health problems may be at greater risk of developing dependence⁵³.

The risks of dependence may differ across the different forms of meth/amphetamine^{43 61 62}. Crystal methamphetamine (also known in different countries by multiple street names including “Crystal”, “Ice”, “Shabu”, “Shabu Shabu”, “Tina”, and “Shards”) is a more potent form than meth/amphetamine powder²¹. It is “washed” in a solvent, and the “street” level purity of crystal methamphetamine is likely to be higher than powder or pill forms (purity of the crystalline form may reach 99%)^{63 64}. The crystalline form therefore poses a high dependence potential for users.

Consistent with this is correlational evidence that both acute and long lasting effects occurred at similar levels among infrequent *crystal methamphetamine* smokers compared to regular *amphetamine* injectors¹. A recent study found that use of the crystalline form (as opposed to powder) remained a unique predictor of dependence among a sample of regular users (most of whom injected the drug)⁶².

Dependence risk also varies with route of administration. As outlined above, injecting and smoking have higher bioavailability, onset of effects and peak effects than snorting or swallowing and these factors increase the risk of developing dependence. There is evidence to support this possibility: those who inject meth/amphetamine are at higher risk of becoming dependent^{43 52 61 62 65 66}. Recent evidence suggests that smoking poses increased dependence risk compared to snorting or swallowing⁶².

Dependent users probably account for the bulk of harms; however, those who engage in binge use are also likely to experience the acute consequences of heavy intoxication and associated risks. Both harm and demand reduction interventions should take this into account. Broad based community messages designed to deter use (particularly those providing exaggerated or biased information) are unlikely to have an impact on this group (see Section 5.3).

2. Harms associated with meth/amphetamine injection and use

There is good evidence that the injection of meth/amphetamine is associated with a number of harms. In many instances (e.g. associations with psychosis and dependence), it is use rather than injection *per se* that is related to harm. In this section, we summarise the existing evidence on harms related to meth/amphetamine injection, and briefly, to use more generally. This evidence informs the review of the epidemiology of use, injection and associated HIV and HCV that follows (Section 4). We present the evidence on associations with injection risk and harm first, given the focus of this report.

Most of the peer reviewed literature on the associated harms of meth/amphetamine located for this report has been concentrated in higher income countries in North America, Europe and Australia. The strength of association and/or nature of harms may vary in different countries. This is an important area where additional research is needed, particularly in regions where meth/amphetamine use and injection are known to be increasing.

2.1. Association with HIV

There have been conflicting findings with respect to the association of meth/amphetamine injection and HIV, which have been made more difficult to unravel because of the co-existence of sexual *and* injecting risk behaviours among meth/amphetamine users. The association with HIV infection through sexual transmission has received considerable discussion and debate^{6 10 67-72}. Much (but not all) of the literature in this area has focused upon MSM. Multiple studies have found an association^{71 88-91}; some have remained after controlling for background factors^{73 74}, but others have not^{90 92}. The conflicting findings may be related to the background prevalence of HIV and the population under study – two examples are given below.

Among one study of IDUs in Russia, seroconversion during a one-year follow-up was associated with sex work and frequent meth/amphetamine use⁷⁴. It was *not* associated with the self-reported frequency of sharing injecting equipment, the type of sharing, or type of drug used while sharing. The authors speculated that the association may have reflected the characteristics of injecting among such users, particularly frenetic injecting and binge use

patterns; but emphasised the importance of concomitant sexual risks and polydrug use among the group⁷⁴. In contrast, in Australia among a largely non-injecting MSM cohort, use was *not* independently associated with HIV seroconversion after controlling for other factors such as age, being in a relationship with an HIV-positive partner, and engagement in a range of esotericⁱⁱⁱ sex practices⁷⁵.

One study found that methamphetamine use, regardless of the route of administration, was independently associated with HIV infection among female sex workers in Tijuana and Ciudad Juarez, Mexico⁷⁶.

The nature and strength of association are likely to vary according to a number of factors including the population, the background prevalence of HIV and other STIs and BBVIs, the stage of the HIV epidemic, and the prevalence and frequency of HIV risk behaviours.

2.2. Injection risk behaviours

There are multiple risks associated with drug injection which may place users at risk of contracting BBVI, infections related to non-sterile injection, and drug dependence⁹⁴⁻⁹⁹. Risky injecting behaviours include sharing injecting equipment with other injectors, reuse of one's own injection equipment, hurried injection (e.g. if injecting in a public place and fearing discovery), and frenetic injecting when on drug use "binges". All of these risk behaviours have been documented among meth/amphetamine injectors, and place such IDUs at risk of contracting HIV, HCV, and other infections.

As mentioned in Section 1, there are good reasons to expect a strong association between drug injecting and dependence. Meth/amphetamine injectors are indeed more likely to be dependent upon the drug than non-injectors^{47 65-66}. Because it marks heavier use, meth/amphetamine injection (compared to other routes) is also therefore a marker for greater exposure to possible risk taking and HIV. It may also reflect a greater propensity to risk-taking by the user in general⁶⁶.

ⁱⁱⁱ "Esoteric sex" or "adventurous sex" includes fisting, water sports, sadomasochism, bondage and discipline, and fetish sex.

There have been some studies evaluating the comparative injection risks of meth/amphetamine injectors compared to other drug injectors. Some have found that heroin injectors are more frequent injectors than meth/amphetamine injectors^{77 78}, but others have not⁷⁹. The disparate findings we discuss below in terms of associated risk behaviours might relate to differences in the frequency of injection, reflecting levels of dependence^{52 65 78} and the window of risk opportunity.

Comparisons of the level of injecting risk between meth/amphetamine injectors and other drug injectors have produced equivocal findings. Some have found that they were: more likely to share injecting equipment^{79 80}; no different in their likelihood^{101 105-108}, or less likely than heroin injectors to share⁷⁷. Some have adjusted for confounding factors in analyses⁸⁰, others have not^{101 105-106}.

One United States study found that, compared to heroin injectors (who were also more frequent drug injectors), meth/amphetamine injectors were less likely to be injecting in public places and less likely to use a needle multiple times⁷⁷. They were also more likely to obtain clean needles from friends/dealers rather than on the street⁷⁷. There was no adjustment for other factors such as demographics or drug injection frequency.

Some important demographic correlates of meth/amphetamine versus injection of other drugs have been noted in the literature. Numerous papers have reported that meth/amphetamine injectors tend to be younger than opioid injectors^{81 100-102 104 109}. Some have also found that they had lower levels of education and social functioning^{104 105}, but were less likely to have a criminal record⁸² or be unemployed^{104 110}.

A study of regular meth/amphetamine users in Australia found female injectors had higher rates of injection risk behaviours than males⁸³, whereas another in Tanzania looking at heroin injectors found males to be more likely to share injecting equipment than females⁸⁴. Some studies have found female meth/amphetamine injectors to be even more likely than those injecting other drugs to be taking injecting risks^{79 85}. Active MSM meth/amphetamine injectors have also been found to have higher rates of injection risk behaviours relative to heterosexual injectors^{89 102 104}.

Meth/amphetamine injectors have consistently been found to be less likely than heroin injectors to engage in drug treatment^{77 78 80 81}, or be in touch with HIV outreach services⁷⁷. Meth/amphetamine injectors are more likely than heroin injectors to stock up on needles

rather than picking up one at a time⁷⁷. The tendency for meth/amphetamine injectors to inject in “binge” patterns of use (similar to cocaine injectors) also makes it harder to provide coverage for these IDUs. These findings suggest that the opportunity for traditional service models to engage with these IDUs may be limited.

2.3. Sexual risk behaviours

Sexual risk behaviours confer risk of both HIV transmission and STIs such as chlamydia, gonorrhoea and syphilis. There is evidence to suggest that STIs also increase the risks of HIV infection if exposed to the virus^{86 87}. The ways in which drug use is linked to sexual risk taking are probably multiple and are considered below.

Sexual risk behaviours can be thought of as 1) risks that occur within a particular sexual episode, such as anal sex, unprotected vaginal intercourse or UAIC; and 2) those that make exposure to HIV or STIs more likely, such as having multiple sex partners, having a sex partner who injects drugs, having sex with a sex worker, or engaging in sex work. The literature on this topic is very inconsistent in the way that these differences are discussed (or even made explicit), but these two kinds of risk will require different responses in terms of harm reduction.

Meth/amphetamine has been linked to sexual risk with multiple groups. These include: MSM, sex workers (SW), men who purchase sex, heterosexually active people, and occupational groups.

Numerous papers in multiple countries have mentioned higher rates of sexual risk behaviour among meth/amphetamine users or injectors compared to other drug users/injectors^{100 102 108 115-118}. Multiple papers, many from the United States, have documented higher rates of sexual risk behaviours among MSM who report using meth/amphetamine^{10 88-98}; similar associations have been found in Australia^{68-70 99}, particularly with UAIC^{6 10 94} and more frequent UAIC¹⁰⁰.

A number of studies in multiple countries have found that meth/amphetamine users have higher rates of STIs^{117 129}. One United States study found that among IDUs who were not in treatment, risky sexual behaviour still provided a unique risk for HIV infection¹⁰¹.

There is good evidence to suggest that meth/amphetamine use and risky sexual behaviours co-occur within a constellation of other important factors, some of which are related to the drug, and some of which are not. There is evidence that: 1) the characteristics of meth/amphetamine users may be related to higher risk behaviours in general; 2) meth/amphetamine increases sexual interest and arousal; 3) many users may use meth/amphetamine *because* they wish to feel sexually disinhibited, and some of the behaviours they consequently engage in may be risky; 4) some aspects of meth/amphetamine's direct effects may facilitate sexual risk and HIV transmission; and 5) HIV risk perception may play an important role in some populations of users.

The literature on sexual risk and meth/amphetamine use is largely concentrated in North America and often focused upon MSM; in addition investigations rely almost exclusively on self-reporting of sexual behaviours. It remains unclear how much each of the above explanations contribute to the association between meth/amphetamine use and sexual risk/HIV transmission. An association between drug use, risk behaviour and HIV transmission does *not* immediately imply causality. Unfortunately, existing research has used varying definitions, and has tended to control for differing drug types, while adjustment for confounding variables has been poor, and much of the research has been cross-sectional¹⁰². It is necessary to conduct research that examines potential confounding variables, and which undertakes episode level analyses of risk.

2.3.1. Characteristics of meth/amphetamine users

As noted above, many studies have not adjusted for confounders. Briefly, some possibly important variables are outlined in this section. They are not intended to provide an exhaustive list.

Some demographic characteristics may be related to the higher levels of sexual risk. Users tend to be younger and more sexually active in general^{20 109 115 116 77 79 103 104}.

It is likely that meth/amphetamine users are more impulsive, or predisposed to taking greater risks overall, than non-users^{71 96 125}. In one sense, drug use (particularly illicit drug use) can be seen as a marker of willingness to engage in risk taking.

Meth/amphetamine is not unique in being linked to sexual risk: amyl nitrite and numerous other drugs that enhance sexual functioning have been associated with STI and HIV transmission^{10 131-134}. In many countries, alcohol is probably the most common drug with disinhibiting effects that is used to facilitate sexual encounters.

Rates of meth/amphetamine use are higher among some MSM who engage in other risk behaviours such as esoteric sex acts. Such sub-populations are probably more likely to include men who take greater risks during sex irrespective of meth/amphetamine use: they are more likely to engage in UAIC^{99 105} and become HIV positive⁷⁵. A recent study involved men who self-identified as engaging in these sexually adventurous behaviours⁶⁹; these men preferred to have unprotected sex, engaged in a considerable amount of casual sex, and many had engaged in UAIC; most used drugs during sex and meth/amphetamine was the most commonly used drug⁶⁹. However, although drug use was involved in unsafe sex, many of these men considered that there were many reasons for unsafe sex, of which drug use was a relatively minor one.

Some studies strongly suggest that a number of factors predict an increased likelihood of UAIC among MSM^{106 107}. Decisions to engage in UAIC have been associated with knowledge of a partner's HIV serostatus and risk reduction strategies, rather than drug use¹⁰⁷. One study of MSM who used meth/amphetamine during sex found that rates of sexual risk behaviours (UAIC and esoteric sex) were the same *regardless of whether they used meth/amphetamine during that sex episode*⁹²; in other words, the men in the study engaged in sexual risk broadly, whether or not they were also using meth/amphetamine. A recent study found that one of the predictors of *beginning* frequent meth/amphetamine use was *prior* regular engagement in esoteric and risk sexual practices¹⁰⁸.

Some studies have controlled for confounding factors in multivariate analyses and the association between meth/amphetamine use and sexual risk has remained^{79 90 101}, but not all studies have found that a unique association remained^{102 137 138 140}. Meth/amphetamine use was independently associated with lower rates of condom use, sex work, sex with IDU and having an STI in a non-injecting US sample⁷³, suggesting that a constellation of risk factors are likely to co-occur, which all increase the risk of BBVI transmission. In summary, although meth/amphetamine use is associated with higher risk sexual behaviour, it is not clear that this association is causal.

2.3.2. Direct effects of meth/amphetamine

Meth/amphetamine stimulates general arousal and energy, as well as producing sexual arousal, lowered inhibitions and increased self-confidence. There is evidence that meth/amphetamine increases libido and “sexual desire”, from both survey research¹ and laboratory studies¹⁰⁹. It has been suggested that the disinhibiting effects of the drug are related to increased risk taking.

Any drug use is linked to expectations of the drug’s effects^{110 111}. Many users use a drug precisely *because* they wish to experience loss of inhibitions, a sense of escape, or to heighten sexual encounters such that they may be more intense or pleasurable for that individual^{69 110-113}. The effects upon sexual arousal that are commonly reported by meth/amphetamine users may often be the precise reason why they take the drug: effects on sexual arousal and feelings of sociability are also commonly reported as positives of the drug^{11 69 142-145}. It may therefore be the case that meth/amphetamine facilitates risky activities (both sexual and injection) when under the influence.

Regardless of effects upon libido, because it is a stimulant drug, meth/amphetamine also allows for prolonged duration of sex. This obviously means that there is an extended period during which unsafe sex may occur. Some users may take other drugs such as Viagra to facilitate these extended sex sessions^{114 115}. Finally, meth/amphetamine dries the mucosa and reduces the sensitivity of the rectal and genital areas¹¹⁶. This can facilitate longer and rougher sexual episodes, and contribute to increased likelihood of bruising and tearing in the region and thus of increasing opportunities for transmission of infections.

2.3.3. HIV risk perception

In recent years, there have been reports of increases in rates of sexual risk behaviours among homosexually active men in Europe, Canada, the United States and Australia¹¹⁷. In the United States, meth/amphetamine has received much attention as a possible reason for this increase, given the increased availability of meth/amphetamine in the United States during this time. However, increases in sexual risk behaviours with casual partners have occurred among homosexually active men in England during recent years *without changes in the availability or use of crystal methamphetamine*^{118 119}, suggesting that multiple factors explain this change.

Changes have occurred over the past decade in the epidemiology of HIV and its treatment in high income countries, particularly those where the HIV epidemic has been concentrated among MSM, such as Australia and the United States. Improvements in treatment outcomes have led to an increase in optimism about HIV since the early 1990s¹²⁰. It has been suggested that the advent of highly active antiretroviral therapy (HAART), with the reductions that it causes in HIV viral load and HIV/AIDS morbidity and mortality, may have led to changes in risk behaviours among MSM in such countries^{117 121-123}. This could be because there is a (correct) understanding that reduced viral load reduces or removes infectivity. There are several possible mechanisms^{117 124}:

1. HIV positive persons receiving HAART (versus those who are not) may be more likely to engage in sexual risk behaviours;
2. persons with an undetectable viral load may have greater sexual risk behaviours than those with a detectable viral load; and
3. *beliefs* about the impact of HAART on infectivity (irrespective of a person's own infectivity) may be related to sexual risk behaviours.

A meta-analytic review of research on HAART and sexual risk behaviours among MSM synthesised existing research on these issues¹²⁴. Across the existing studies, there was no significant relationship between receiving HAART treatment or having a detectable viral load and the likelihood of sexual risk behaviours. There *was* an association between *perceptions* of HAART or viral load, and sexual risk. Those who thought that HAART reduced HIV transmission, or for whom unsafe sex was less of a concern given the availability of HAART, were more likely to engage in unsafe sex (an association found in 12 of 18 studies)¹²⁴. This suggests that HIV risk perception is an important factor related to the likelihood of sexual risk^{121 125 126}.

These findings will not have relevance in countries where there is poor HIV treatment coverage, or without knowledge of HIV-related sexual risk among risk populations. In the case where HIV knowledge is limited, sexual risk behaviours may reflect this lack of knowledge; in areas where HIV treatment is limited, the impact of HAART is minimal.

It is worth noting that the above review did not assess the impact of HAART upon injecting risk behaviours. One recent study of a cohort of HIV positive injecting drug users found that those who entered HAART *reduced* their levels of drug injecting prior to treatment entry, and maintained these reductions post entry¹²⁷. This area requires further research.

2.4. Meth/amphetamine use among HIV positive persons

2.4.1. Reasons for meth/amphetamine use

The reasons for meth/amphetamine use among persons living with HIV need to be considered. They are highly likely to vary across regions in the world and across population sub-groups. In this section we very briefly provide an overview of the possible reasons for use, which are very important factors to consider in programme and intervention planning. Most of the research conducted on this issue has been concentrated among HIV positive MSM, largely in higher income countries such as the United States; we make a reasoned case for other determinants of use in different country contexts.

Previous research with HIV positive men (largely in the United States) has found that many use meth/amphetamine for the same reasons as HIV negative men: to feel good, to experience sexual arousal, and to reduce their inhibitions¹²⁸. However, some use meth/amphetamine in order to “escape” from awareness of their HIV positive status, to manage negative feelings, and to cope with the prospect of death from HIV/AIDS^{110 111 128} and the side effects of antiretrovirals (ARVs). Some also use to feel more confident in approaching possible sex partners and having multiple partners¹²⁸. These functions of meth/amphetamine use among MSM with HIV need to be considered in any interventions designed to address use.

This evidence is most likely to be relevant in countries where knowledge of HIV is probably good among MSM populations and the reasons for use in the first place tend to be recreational ones. This is less relevant for MSM populations where HIV knowledge is limited (which might be reasonably expected in low and middle income countries with less established HIV educational programmes).

The evidence is also of limited relevance where use is concentrated among other groups to sustain heavy work hours as happens in South East Asia¹²⁹ and among some occupational groups e.g. truck drivers in multiple countries and regions^{73 159-161}. Among such populations, use by HIV positive individuals may be occurring without the affected individuals being aware of their HIV status (or its implications). It may be difficult for users to cease use if they cannot continue to complete their work demands. Finally, communication about risks of HIV transmission may need to be more appropriately targeted to heterosexual users.

2.4.2. Impact upon viral replication

In cell cultures and animal models, methamphetamine has been found to accelerate retroviral replication¹³⁰. Research with humans to examine whether methamphetamine was associated with increased viral replication suggested that methamphetamine use was also associated with increased viral loads even among those taking HAART¹³¹. There needs to be more research conducted to examine whether methamphetamine alters metabolism of ARV medications¹³¹, but in summary, there is evidence suggesting that the use of methamphetamine may interact with the virus itself.

2.4.3. Synergy of neurotoxic effects

Evidence continues to mount that chronic methamphetamine use is associated with persistent changes in a number of brain neurotransmitter systems¹³²⁻¹³⁴. These changes may be functionally significant: abnormalities in brain function in methamphetamine dependent persons were found in brain regions implicated in mood disorders such as depression, and were correlated with reports of depression in these individuals⁵⁵. Reassuringly, continued abstinence from use may result in some return to normal neurotransmitter function¹³⁵.

One of the possible consequences of HIV infection is HIV-related dementia, a clinical condition involving deficits in memory, psychomotor slowing, and apathy; later stages of the illness can include psychomotor deficits and gait disturbance¹³⁶. The effects of HIV and methamphetamine upon neurotransmitter function are similar in some ways, and there is some evidence to suggest that meth/amphetamine may have a negative impact upon HIV dementia^{72 130 137}. One case study suggested that HIV dementia was accelerated in a meth/amphetamine dependent individual¹³⁸.

Recent studies have suggested that chronic meth/amphetamine use and HIV might have additive negative effects^{137 139 140}. One study extended prior findings by examining the combined effects of meth/amphetamine dependence and immunosuppression (defined as CD4 lymphocyte count <200) on neuropsychiatric functioning¹³⁹. Both factors were associated with neuropsychiatric impairment, and further, "additive" effects were suggested: those who were both meth/amphetamine dependent *and* who had immunosuppression had higher levels of neuropsychiatric impairment. These findings are cause for concern¹⁴¹.

2.4.4. Interactions with HIV treatment

2.4.4.1. *Meth/amphetamine's effects*

There is evidence to suggest that the effects of meth/amphetamine (and other ATS such as MDMA) may be greater for HIV positive persons receiving combination ARV therapy, particularly *ritonavir* (a protease inhibitor)^{10 72}. Ritonavir has greater affinity for certain enzymes (such as CYP2D6) than methamphetamine, so blood levels of methamphetamine (if used concomitantly) may be three to ten times greater than among those not taking ritonavir¹⁴². Amphetamine type stimulant use has been listed as a contraindication to the use of ritonavir¹⁴³.

There has been one Australian case report of an HIV positive man receiving combination ARV therapy, which included ritonavir, who died from a methamphetamine overdose following injection of the drug¹⁴⁴, and case reports of MDMA-related fatalities occurring in the same manner¹⁴⁵.

Potential interactions are important to consider and need to be investigated further. Despite this, the manufacturers of antiretroviral treatments have thus far failed to either provide available data on illicit drug-ARV interaction to doctors and patients, or to conduct relevant studies¹⁴³. It is important to note however that currently meth/amphetamine is not considered a contraindication to ARVs other than ritonavir.

2.4.4.2. *Impact upon treatment adherence*

Poor adherence to HAART is associated with the development of resistance to ARV drugs and less effective inhibition of viral replication^{131 146}. People using meth/amphetamine have poorer HIV treatment adherence than those who do not^{147 148}. A recent United States study has examined this issue prospectively using objective measures of drug use and adherence¹⁴⁸. It found that over six months, those using drugs were four times more likely to be non-adherent to their HIV medication. Stimulant drug users were at the greatest risk of non-adherence¹⁴⁸.

One United States study examined “planned” versus “unplanned” non-adherence. It found that among HIV positive men in treatment for meth/amphetamine dependence, meth/amphetamine was associated with unplanned non-adherence to HIV medication¹⁴⁷. This was distinct from “planned non-adherence” to treatment whereby HIV positive persons take a

break from the schedules of HIV medication. Unplanned adherence was thought by participants to be the result of the impact of meth/amphetamine upon sleep and food intake¹⁴⁷.

2.5. Viral hepatitis

The association between injecting drug use and HCV is well documented. Existing estimates of the prevalence of HCV among meth/amphetamine users and injectors are presented in Section 4. Hepatitis B outbreaks have been documented among meth/amphetamine users, and related to sharing of injection equipment¹⁴⁹. One outbreak of hepatitis A was reported among injecting meth/amphetamine users in Finland, of whom 6% died of acute liver failure¹⁵⁰.

A recent meta-analytic review identified increased HCV risks even among drug users who had *never* injected drugs¹⁵¹. This is likely to be of concern particularly for persons smoking meth/amphetamine, who may be sharing smoking equipment and who may be at risk of transmission of HCV through such methods¹⁵¹, particularly if skin lesions occur. Higher rates of sexual risk and of other risk factors such as tattooing may also place non-IDUs using meth/amphetamine at heightened risk of contraction of HCV^{151 152}.

A recent study found that HCV infection was independently associated with greater neuropsychiatric impairment even after controlling for illness stage, ARV use, and meth/amphetamine use (all of which were also independently associated with impairment)¹⁴⁰. The authors concluded that HCV may injure the brain by viral or immune-mediated mechanisms.

Ten per cent of subjects recruited in a recently completed clinical trial in Sydney, Australia, of *modafinil* for meth/amphetamine dependence were co-infected with HIV and HCV¹⁵³. In this study, all co-infected subjects were MSM with histories of meth/amphetamine *injection*. Obviously, if HCV has spread from the injecting population to the MSM population, then there is a risk that HIV could bridge over to other populations of injecting drug users (where HIV prevalence is currently low in Australia¹⁵⁴) and their sexual partners¹⁵³.

Risks apply to co-infection of HCV with HIV. The neuropsychiatric effects noted for persons with either HIV or HCV were noted to be “augmented” among persons who had both viruses

in one study¹⁵⁵. HIV/HCV co-infected patients have higher HCV RNA loads and show more rapid disease progression than patients without HIV¹⁵⁶. Combination therapy with pegylated interferon plus ribavirin (RBV) is recommended and slows disease progression¹⁵⁶; WHO guidelines recommend that HCV is treated *before* HIV treatment is started. There are clinical challenges: co-infected patients have a greater risk of ART-associated liver toxicity, and anaemia and drug interactions may occur¹⁵⁶.

2.6. Other injection-related injuries and diseases

Numerous adverse consequences of unsafe or non-sterile injection can occur and include infective endocarditis, abscesses, embolisms, thrombosis and other local tissue or vein damage¹⁵⁷.

2.7. Acute negative side effects of meth/amphetamine use

Meth/amphetamine has a number of adverse side effects. These include physical manifestations such as sweating, heart palpitations, headaches, tremors, and increases in body temperature^{1 2}. Adverse psychological side effects include restlessness, anxiety, dizziness, irritation, confusion and aggression^{1 2}. Cardiovascular toxicity may also occur, and includes arrhythmias, acute myocardial infarction and cardiomyopathy^{2 158}. Cerebrovascular toxicity can occur and includes stroke, aneurysm, and cerebral haemorrhage^{2 53}.

Debate exists around the nature of the association between meth/amphetamine intoxication and criminal violence and aggressive behaviour¹⁵⁹. It is most likely that the relationship is complex rather than a simple causal link: individual factors including personality and the characteristics of the situation as well as cultural factors all appear to be important¹⁵⁹⁻¹⁶².

2.8. Mental health problems

2.8.1. Psychosis

It is well-established that high doses of stimulants such as meth/amphetamine can induce a transient psychotic disorder, which closely resembles psychotic illnesses such as paranoid

schizophrenia¹⁶³⁻¹⁶⁵. Symptoms of meth/amphetamine-induced psychosis include mood swings, hallucinations, paranoid delusions, impulsivity, and the potential for aggression and violence^{198 199}. Delusions, paranoia, panic and loss of behavioural control can also occur^{1 2 166}. Limited research has suggested that *methamphetamine* psychosis lasts longer than *amphetamine* psychosis¹⁶⁶. In some countries, the use of crystal methamphetamine has received attention because of its relationship to methamphetamine-induced psychosis, and apparent association with increased cases in recent years¹⁶⁷⁻¹⁶⁹. One multi-country study found that among those hospitalised for meth/amphetamine-induced psychosis, the most common symptoms were auditory hallucinations, strange or unusual beliefs, and “thought reading”¹⁷⁰.

Meth/amphetamine psychosis often follows a period of recurrent binge use of the drug, which may include escalating doses across binges¹⁷¹. Psychotic symptoms have been linked to blood levels of the drug¹⁷², although some psychotic symptoms may be experienced (particularly by persons vulnerable to psychosis) at relatively low levels²⁰⁵⁻²⁰⁷. Some researchers have invoked possible gene-environment interactions, whereby those with the Ala/Val polymorphism of the SOD2 gene could be could have a greater risk of developing meth/amphetamine psychosis if they use the drug¹⁷³, although there is a clear need for multiple replications of this finding.

Some have suggested that sensitisation to meth/amphetamine psychosis may develop¹⁷⁴⁻¹⁷⁶. This refers to the possibility that persons who have previously developed meth/amphetamine psychosis may be more likely to develop psychotic symptoms at lower levels of use, should they return to use.

Decreasing blood levels of meth/amphetamine (following reduced use) will typically lead to a reduction in psychotic symptoms¹⁷⁷. Among persons vulnerable to psychotic illness, or among those who have already developed psychotic disorders, exacerbation of symptoms may not be ameliorated through simply reducing use.

2.8.2. Other mental health problems

Heavy meth/amphetamine use may have negative effects upon mental health, particularly for persons vulnerable to mental health problems. A prospective study of persons with psychotic disorders (such as schizophrenia) found that those who were using stimulant drugs (cocaine or amphetamines) at baseline were eight times more likely to commit suicide during a five-

year follow-up period¹⁷⁸. A Taiwanese study of meth/amphetamine using adolescents found that 16% had current suicidal ideation¹⁷⁹, and among adults incarcerated for meth/amphetamine use problems, very high rates of comorbid psychiatric problems were found¹⁸⁰. Further, among juvenile Taiwanese meth/amphetamine users committed for criminal offences, those with comorbid psychiatric problems were more likely to be recommitted by a later time point¹⁸¹. Those who inject meth/amphetamine more than weekly may be at greater risk of such problems¹⁸².

2.9. Mortality

Death can occur because of meth/amphetamine use^{183 184}, but the magnitude of this risk is probably much less than that for opioids^{185 186}. Reviews of coronial data sources have suggested that the most frequent causes of death related to meth/amphetamine are accidental overdose (typically involving multiple drugs), trauma (often traffic accidents), suicide and homicide¹⁸⁵. The mechanism of death in many cases is sub-acute or acute cardiopulmonary failure; hyperthermia is also commonly mentioned¹⁸⁵.

3. Global meth/amphetamine markets

The international ATS market is diverse both geographically and in the forms produced³. It is a comparatively inexpensive drug to manufacture, and can be produced virtually anywhere – in contrast to drugs such as cocaine and heroin, which require certain climatic and geographic attributes for cultivation, and where crop surveillance can be conducted aerially and by satellite surveillance. There is a broad trend from plant-based to chemical-based drug production.

This section provides a very brief overview of recent trends in the global production and consumption of meth/amphetamine. This material is drawn largely from the United Nations *World Drug Report*³. The interested reader is strongly encouraged to consult more detailed work from individual countries and regions for richer data and greater depth^{4 187 188}.

3.1. Production areas

Dramatic increases in the production of all ATS were documented throughout the 1990s in many regions; these increases appear to have slowed in rates in recent years³. The United Nation's *World Drug Report* attributed this to efforts to monitor and improve meth/amphetamine precursor control³.

The largest *methamphetamine* production areas are currently in South East Asia (particularly Myanmar, China and the Philippines), Mexico and North America. Traditionally, the majority of methamphetamine was produced in the United States, with precursor chemicals imported from Canada and Mexico. With increased precursor controls in Canada and the United States, there were declines in United States clandestine laboratories and a shift to Mexico³; with increased controls in Mexico recently, other regions may have been targeted. It bears mentioning that the bulk or “super” laboratories are concentrated in Mexico; the laboratories in the United States tend to be small, and largely use precursors derived from common cold medicine¹⁸⁹. Recent data suggest that drug trafficking organisations might be increasing production in other areas including Central America and possibly Africa³; this would be consistent with recent increases in both production and use of methamphetamine in the Republic of South Africa¹⁹⁰. Australia and New Zealand have considerable domestic

production, with the use of stronger forms of methamphetamine (particularly crystal methamphetamine) and harm having increased over the past decade^{191 192}.

Amphetamine production continues to be primarily located in Europe, notably in the Netherlands and Poland, followed by the Baltic region and Belgium. Ecstasy (MDMA) production continues to be largely concentrated in Europe, though the expansion of ecstasy production in recent years has been largely in East and South East Asia³.

3.2. Types produced

Global seizures of ATS are dominated by seizures of methamphetamine. Since 2000, it is estimated that half of all ATS seizures (49%) were methamphetamine, 15% amphetamine, and 14% MDMA; the remainder are unknown³. Recent years have seen a trend for a rising proportion of amphetamine (compared to methamphetamine) seizures. It has been argued that this reflects improved control over the two main precursors for methamphetamine production (ephedrine and pseudoephedrine)³, although there are no signs yet that production of methamphetamine has decreased in Mexico¹⁸⁹.

In 2005, half of amphetamine and methamphetamine seizures were in East and South East Asia, one-fifth each were in North America and West and Central Europe³. In the case of ecstasy, 38% of global seizures were in West and Central Europe, 27% in Oceania region, 20% in North America and 9% in East and South East Asia³.

3.3. Use

It has been estimated that during 2006, 25 million persons had used meth/amphetamine with 15-16 million using methamphetamine³. Such estimates suggest amphetamines are used by many more people than opioids or cocaine, but far fewer than cannabis. The global use of ATS is showing signs of stabilisation according to the latest United Nations *World Drug Report*³.

The context of meth/amphetamine use and injection will vary significantly across the globe. This includes the reasons for use. Meth/amphetamine has effects upon general arousal and energy, as well as upon sexual arousal, lowered inhibitions and increased self-confidence. In

many high income countries, use is typically for recreational purposes, and users may use a meth/amphetamine precisely *because* they wish to experience increased sociability, loss of inhibitions, a sense of escape, or to heighten sexual encounters such that they may be more intense or pleasurable for that individual^{69 110-113}.

In some countries and user populations, use may serve a different function. Jade mine workers in Myanmar use methamphetamine to sustain long work hours¹²⁹; similar motivations might exist for sex workers in Cambodia¹²⁹. The United States government provided Air Force pilots with amphetamines during operations in Desert Shield and Desert Storm (who reportedly appreciated them)¹⁹³, and to those in Operation Enduring Freedom in Afghanistan.

In many high income countries, meth/amphetamine users will typically have used a wide range of other drugs, which may be used in combination with meth/amphetamine, and may be used heavily⁶⁵. There is little evidence on the natural history of meth/amphetamine and how it is related to users' drug use careers. One Australian cohort study found that early onset meth/amphetamine use typically occurred after cannabis use had already begun¹⁹⁴; and early onset cannabis use was strongly related to the initiation and maintenance of meth/amphetamine use during young adulthood for this group¹⁹⁵. In some settings meth/amphetamine is used in combination with heroin or cocaine¹⁹⁶. Some users consider meth/amphetamine their "primary" drug, whereas others may be primary users of other drugs such as heroin; the context and importance of meth/amphetamine will therefore differ for these different groups.

In other countries where use is concentrated among some occupational groups, this drug use may be less extensive, and/or concentrated to one or two other drugs (e.g. alcohol use among truck drivers in Brazil¹⁹⁷). The extent to which other drug use needs to be considered as an additional harm will need to be evaluated separately in different regions and will carry implications for harm reduction and demand reduction efforts for meth/amphetamine.

In Section 4, we present available country-specific data on meth/amphetamine use and injection in the general population and various risk groups. As will become clear, there is a great need for up-to-date estimates produced by well-designed epidemiological studies in most countries of the world. In Section 3, some of the major risks associated with meth/amphetamine injection, including associations with HIV, are outlined as a background to the epidemiological data in Section 4.

4. The epidemiology of meth/amphetamine use, injection, and association with HIV

As with previous attempts to document the prevalence of drug use across the globe¹⁹⁸, this report is largely characterised by a lack of data in many countries, and as such there is a need to make comments based largely on anecdotal reports, or data sourced from reports that do not include detail about the methods used.

The paucity of data in many countries probably reflects a range of issues including: limited resources, concentration of drug use among small or hidden groups, stigma regarding the research into and reporting of drug use, and/or limited research capacity. There are significant difficulties in the conduct of illicit drug research in developing countries¹⁹⁹, but issues facing detailed epidemiological investigations of drug injection and its related harms are also considerable in developed countries with a more established history of illicit drug research. There is a strong imperative, given the risks summarised above and evidence of increasing use in some regions, for a concerted investment to produce better quality epidemiological data on meth/amphetamine use and injection, and associations with HIV and HCV.

Several issues deserve mention. First, household survey-derived estimates of past year meth/amphetamine use are *very* poor indicators of the extent of problematic use, for multiple reasons that include the exclusion of at-risk groups (e.g. the homeless) and underreporting, among other things²⁰⁰. Second, data on drug use among at-risk groups should be collected as part of drug monitoring systems as they will suggest how commonly problematic use is occurring. Third, the proportion of drug treatment episodes where meth/amphetamine is mentioned is a better indicator. However, it is most certainly a lagging indicator (dependence takes time to develop). Most countries do not have routine treatment data collections, recording differs across countries^{iv}, and treatment systems geared to opioid users struggle to engage meth/amphetamine users, so these data are likely to significantly underestimate treatment need. Finally, we need better collection of data on route of administration and meth/amphetamine forms, as these appear strongly linked to the extent of meth/amphetamine problems.

^{iv} Some countries report drug use among treatment entrants; others report the main drug of concern. Both statistics are useful and should be reported clearly.

4.1. Eastern Europe and Central Asia

The number of persons living with HIV is still increasing in Eastern Europe, although not to the extent that was seen in the 1990s²⁰¹. Transmission is largely due to injecting drug use (63% where a mode of transmission was noted), and the large majority of persons living with HIV live in the **Russian Federation** and the **Ukraine**²⁰¹. HIV infections may be increasing among IDUs in **Kazakhstan**, **Uzbekistan** and **Tajikistan**²⁰².

It is therefore of concern that both problematic use and injection of meth/amphetamine may be prevalent in Eastern Europe (Table 2). Meth/amphetamine (“pervitin”) is an established – and increasing – problem in the **Czech Republic**^{203 204}. Estimates suggested that in 2005, 0.3% of the population were currently meth/amphetamine dependent, with higher rates among younger females, and the drug mentioned in 58% of drug treatment episodes²⁰³. HIV is around zero, but HCV is common among this group. Seizure sizes are small although 261 labs were dismantled in 2005, with calls for tightening pseudoephedrine control made given that amphetamine is domestically produced from over-the-counter sources²⁰³.

Frequent meth/amphetamine use has been found to be a very strong predictor of HIV infection in the **Russian Federation**⁷⁴. Although population prevalence is low, injection is common among IDU, and HIV is prevalent among this group, with a strong link between frequency of meth/amphetamine injection and HIV prevalence. One study found that it was meth/amphetamine injection frequency that was independently associated with HIV seroconversion, rather than self-reported frequency of injecting equipment sharing, the type of sharing, or the type of drug used while sharing, engaging in sex work and having multiple sexual partners⁷⁴. The authors discussed the possibility that this might be related to more frequent injection; clearly, meth/amphetamine injection is a marker for elevated risk among this group.

In **Belarus**, there is good evidence that the availability of meth/amphetamine is increasing²⁰⁵. Seizures of amphetamines by law enforcement have reportedly increased by 69.4 times since 1998. Most amphetamines are reportedly being supplied from Holland, Poland and the Baltic States²⁰⁵. At the end of 2005, 3.7% of “registered users” were using meth/amphetamine, with IDU the dominant route; 3% of all IDUs were meth/amphetamine injectors²⁰⁵.

Poland appears to be experiencing increased problems related to meth/amphetamine. It is commonly detected in poisoning cases, is the second most common drug noted in possession

offences, and treatment episodes are increasing²⁰⁶. No data on meth/amphetamine IDU specifically could be obtained, but among IDU broadly, HIV prevalence rates are 7-16%, and 56-58% for HCV²⁰⁶.

In multiple other Eastern European countries including **Latvia**, **Lithuania** and **Slovakia**, meth/amphetamine has been clearly reported as an increasing problem but data are much more limited. Injecting of the drug was reported as an issue in Slovakia, and treatment numbers are increasing²⁰⁷. A significant problem has been noted in **Hungary**, with 9% of treatment entrants being for meth/amphetamine use²⁰⁸ and high rates of syringe sharing among IDU broadly²⁰⁹. HIV prevalence is less than 1% among this group, but HCV prevalence is 14%²⁰³.

In **Romania**, no specific data on meth/amphetamine IDU were found, but risks are high: 73% of IDU generally stated that they used unclean needles in their last injection, HIV prevalence was 0.3%, and HCV 19% in 2004²¹⁰.

In most countries of Central Asia, almost no data could be obtained in searches on meth/amphetamine use, injection, and associated HIV or HCV. This does not imply that use and problems are not occurring.

Table 2: Data on meth/amphetamine use, injection and HIV in Eastern Europe and Central Asia, by country

Eastern Europe and Central Asia	MA use in general population	Year	MA use in at risk populations	Year	% IDU among MA users	Year	% MA IDU HIV+	Year	% MA IDU HCV+	Year	Comments
Armenia	0.04% ³	2005	--		--		--		--		
Azerbaijan	--		--		--		--		--		
Belarus	0.4% ³	2005	3.7% "registered users" ²⁰⁵	2005	--		--		--		Trafficking occurring, seizures made ²¹¹
Bosnia and Herzegovina	--		--		--		--		--		
Bulgaria	0.4% ¹⁸⁷ 0.9% 15-34yrs ¹⁸⁷	2005 2005	1.1% of treatment entrants ¹⁸⁷	2004 2005	0% treatment entrants ¹⁸⁷	2004 2005	--		--		Not detected in fatalities 1990-2000 ²¹²
Croatia	0.5% ³	2003	--		--		--		--		
Czech Republic	0.7% ¹⁸⁷ 0.3% dependent ²⁰³	2004 2005	58% drug treatment ²⁰³ ; 25% dance party attendees ²⁰³	2004 2005 2003	--		0% ²⁰³	2003	35% ²⁰³	2003	Dominant problem among problem users ²¹³
Estonia	1.3% ¹⁸⁷ 5.5% 15-34yrs ²¹⁴	2003 2003	--		--		--		--		Injecting documented ²¹⁴
Georgia	--		--		--		--		--		
Hungary	1.0% ¹⁸⁷ 1.9% 15-34yrs ¹⁸⁷ 3% students ²⁰⁸	2003 2003 2003	35-51% of IDU ^{209 215} 9% treatment entrants ²⁰⁸	2003 2001 2003	--		<1% ^{209 216}	2003	14% ²⁰⁸	2004	68% of IDU shared equipment ²⁰⁹
Kazakhstan	--		--		--		--		--		
Kyrgyzstan	--		--		--		--		--		
Latvia	1.1% ¹⁸⁷ 2.4% 15-34yrs ¹⁸⁷	2003 2003	26% sex workers ²¹⁷ ; 25% treatment entrants ²¹⁷ ; 12% "registered children" ²¹⁷	2003 2004 2004 2004	75% sex workers ²¹⁷ 25% treatment entrants ¹⁸⁷	2003 2004 2004	--		--		Most common treated drug problem, increasing ²¹⁷ ; IDU major HIV transmission route, HCV prevalent but underreported ²¹⁷
Lithuania	0.3% ¹⁸⁷ 0.7% 15-34yrs ¹⁸⁷	2004 2004	2% adult treatment entrants ²¹⁸ ; 9% adolescent treatment entrants ²¹⁸	2004 2004	--		1% ²¹⁸	2004	--		Second most common drug ²¹⁸ ; 92% of treated users IDU ²¹⁸ ; 23% of incident HCV and 74% HIV due to IDU ²¹⁸

Eastern Europe and Central Asia	MA use in general population	Year	MA use in at risk populations	Year	% IDU among MA users	Year	% MA IDU HIV+	Year	% MA IDU HCV+	Year	Comments
Moldova	0.2% ³	1998	--		--		--		--		HIV notifications increasing from a small base ²⁰¹ ; Domestic MA production occurring ³
Poland	0.7% ¹⁸⁷ 1.6% 15-34yrs ¹⁸⁷ 3.7% university ²¹⁹ 9.5% students ²⁰⁶	2002 2002 2003 2003	9% treatment entrants ²⁰⁶	2003	--		--		--		Often detected in poisonings ²²⁰ ; treatment increasing ²⁰⁶ ; second most common drug offence ²⁰⁶
Romania	0.1% ³ 0.1% students ²¹⁰	2004 2003	0.4% treatment entrants ¹⁸⁷	2004	0% treatment entrants ¹⁸⁷	2004	0%		--		Small number of hospital admissions ²¹⁰
Russian Federation	0.2% ³	2003	--		36% of HIV-IDU ⁷⁴	2002	20% IDU >3 times per week ⁷⁴ ; 5% IDU 1-2 times per week ⁷⁴	2002 2002	--		
Slovakia	0.3% ¹⁸⁷ 0.5% 15-34yrs ¹⁸⁷	2004 2004	32% treatment entrants ²⁰⁷	2004	32% treatment entrants ¹⁸⁷	2004	0% ²⁰⁷ 34% treatment entrants ¹⁸⁷	2004 2004	46% ²⁰⁷	2004	"Most abused drug" alongside cannabis ²²¹ ; injecting reported as an issue, treatment numbers increasing ²⁰⁷
Tajikistan	--		--		--		--		--		
Turkmenistan	--		--		--		--		--		
Ukraine	0.2% ³	2003	--		--		--		--		
Uzbekistan	0.01% ³	1997	--		--		--		--		

NOTES: LT = lifetime; SW = sex workers; F = female; M = male; IDU = injecting drug use

4.2. East and South-East Asia

The increase in production and use of meth/amphetamine has been one of the most notable trends in East and South-East Asia in the past decade, and has received considerable attention^{169 222}. Table 3 summarises the available data on the epidemiology of use, injection and harm in the region.

In **Thailand**, meth/amphetamine is typically found in crystal and pill forms, and smoking is the most common route of administration⁴. This drug is mentioned in the majority of treatment admissions in the country and 16% of IDUs use the drug⁴. There may be geographic differences: 1% of the entire Bangkok population were estimated as dependent upon the drug in 2001²²³, and a 2004 study found that among IDUs in Bangkok, 49% had injected meth/amphetamine – and this group was highly unlikely to have accessed drug treatment²²⁴. Among IDU in Bangkok who had a prison history, independent risk factors for prevalent HIV infection included meth/amphetamine injection before detention, sharing needles in the holding cell, being tattooed while in prison, and borrowing needles after release²²⁵. Meth/amphetamine users in northern Thailand were found to be a much younger and different population from opium/heroin users in that area, with higher rates of chlamydia infection (and sexual activity)²²⁶ but lower rates of initiation to injection^{227 228}; nonetheless, one study found that 6% of non-IDUs were HCV positive.

In **Vietnam**, swallowing appears to be the currently dominant route of administration for meth/amphetamine which is largely available in pill form⁴. Other users are injecting drugs, particularly opioids; however, in 2004, 88% of drug treatment entrants were IDUs⁴. Very high rates of “extramarital” sex have been documented among HIV positive drug users aged 15-30 years²²⁹, and there is good evidence of a co-occurrence of injecting and sexual risk taking among users in several Vietnamese cities, making multiple risk factors for HIV transmission²⁰¹. Any increase in HIV among meth/amphetamine users is likely to pose risk for their sexual partners.

Japan has an established history of problematic use of the drug despite having an apparently very low general population prevalence of use (0.3%)³. The crystalline form is thought to be the most common, and injecting is a major route of administration⁴. One study found that 7% of adolescents in drug treatment had problems with the drug²³⁰; a study of adults found 67% of meth/amphetamine treatment entrants were injecting⁴³. High risk behaviours occur among this group, with estimates among methamphetamine treatment entrants more

broadly suggesting that 87% share syringes²³¹, and 77% had had sex with commercial sex workers²³¹.

In **China**, evidence of increased use and problems exists, particularly in the north east^{4 232}. In 2005, 14% of “first registered addicts” were meth/amphetamine, MDMA or ketamine users; 11% were injecting and 22% smoking (an increase relative to 2004)²³². Meth/amphetamine use is also increasingly likely in temporary dwellings or “non-fixed places”, as opposed to venues or the user’s home (i.e. use seems to be occurring in more risky locales)²³². HIV is a risk for users with 41% of new infections in China due to sharing of injecting equipment. Among non-IDU meth/amphetamine users, risk of HCV infection is elevated through associated risks such as tattooing¹⁵².

In the **Republic of Korea**, as in **the Philippines**, two-thirds of treatment entrants in 2004 were using the drug^{4 233}; over half of treatment episodes in **Singapore**⁴ and one third in **Taiwan** in 2006 were for methamphetamine. This is consistent with well-established problems in these countries: the drug is typically smoked, and is considered a primary drug problem⁴. A recent study identified a new trend towards increased injection in **the Philippines**, however: meth/amphetamine was being mixed with Nubain[®] (Nalbuphine Hydrochloride), a pharmaceutical mixed opioid agonist-antagonist²³⁴. Multiple risk factors exist for BBVI transmission for these users: one study in **Taiwan** found that tattooing was a risk factor for HCV infection among methamphetamine using prisoners who were not injecting the drug¹⁵².

In **Cambodia**, there is evidence that meth/amphetamine problems are increasing, particularly related to the crystal form⁴. Studies have documented high rates of meth/amphetamine use among risk groups, and reports of injecting the drug have occurred⁴.

In other countries, data were more limited but there are some reports of increasing use in **Brunei Darussalam, Indonesia, Lao People’s Democratic Republic, and Malaysia**⁴. In most of these countries, smoking and/or injecting predominate⁴. In **Myanmar**, pills are the most common form of meth/amphetamine available⁴, and use is apparently increasing. The HIV epidemic in this country is reportedly one of the fastest growing HIV epidemics in the world, with infection through heterosexual and IDU transmission²⁰¹, so there is significant cause for concern.

Table 3: Data on meth/amphetamine use, injection and HIV in East and South-East Asia, by country

East and South-East Asia	MA use in general population	Year	MA use in at risk populations	Year	% IDU among MA users	Year	% MA IDU HIV+	Year	% MA IDU HCV+	Year	Comments
Brunei Darussalam	0.06% ³	2000	--		--		--		--		Crystal primary drug of abuse in the country ⁴ ; IDU is occurring, but MA typically smoked ⁴
Cambodia	0.6% ³	2004	24% of street living/dwelling persons in Phnom Penh ²³⁵	2006	12% of street living/dwelling persons ²³⁵	2006	--		--		Meth pills largest drug problem in the country, crystal fifth largest problem and increasing ⁴ ; most IDU share equipment ⁴
China	--		14% first time treatment entrants ²³²	2005	11% ²³²	2005	--		20% among non-IDU ¹⁵²		Use is increasing ²³⁶ ; pills and crystal second and third largest drug problems in the country ⁴ ; IDU accounts for 41% of HIV infections ⁴
Democratic People's Republic of Korea	--		--		--		--		--		
Indonesia	0.3% ³	2005	19% among "drug users" ²³⁷	2004	--		--		--		All indicators of availability and use increasing, fourth largest drug problem in the country ⁴ ; MA typically smoked ⁴
Japan	0.3% ³	2005	7% adolescents in inpatient treatment ²³⁰		67% of MA treatment entrants ⁴³	1999	0% ²³¹	1994	54% ²³¹	1994	Thought to be major drug of misuse; crystal form is typically used IDU major route ^{4 238 239}
Lao People's Democratic Republic	0.7% ³ 4.8% LT ⁴	2004 2000	42% LT unemployed young people ⁴ ; 34% disco patrons ⁴ ; 14% SW ⁴	2000	--		--		--		Pills primary form and the largest drug problem in the country; no data on crystal/powder ⁴ ; MA typically smoked ⁴
Malaysia	0.7% ³	2005	--		--		--		--		Fourth most common drug of misuse ⁴ ; IDU an increasing HIV transmission route, currently 75% of infections ²⁴⁰
Mongolia	--		--		--		--		--		Use and problems negligible ²⁴¹
Myanmar	0.2% ³ 2% students ⁴	2005 2006	--		--		--		--		Pills most common form, increasing use and third largest drug problem (2006) ⁴ 43% of heroin IDU HIV positive ⁴ ; MA typically smoked ⁴
Philippines	10% ⁴	2004	67% treatment entrants ⁴	2006	--		<1% ²³³	2006	--		Largest drug problem in the country, crystal form dominates ⁴ ; MA typically smoked ⁴

East and South-East Asia	MA use in general population	Year	MA use in at risk populations	Year	% IDU among MA users	Year	% MA IDU HIV+	Year	% MA IDU HCV+	Year	Comments
Republic of Korea	0.1% ³	2004	68% treatment entrants ²³³	2004	90% of prison users ²⁴²	1988	--		--		Reports of "high" HIV prevalence ²⁴² ; No HCV cases identified ²⁴² ; deaths increasing ²³³
Singapore	0.005% ³	2004	55% treatment entrants ⁴	2006	--		--		--		Fourth largest drug problem in the country, may be decreasing ⁴ ; MA typically smoked ⁴
Thailand	0.6% ³ 41% M, 19% F students LT ²⁴³ ; 5% "heavy" use Bangkok students ²⁴⁴ 1% dep. ²²³	2006 1999 2001 2001	75% treatment entrants ⁴ , 16% IDU ²⁴⁵	2006	9% of IDU ²²⁶ , 49% LT of IDU in Bangkok ²²⁴	2000 2004	2% IDU ²⁶⁷ ; 4% F non-IDU ²⁴⁶	2000 1999	6% non-IDU ²²⁷	2000	Crystal the largest drug problem in the country and increasing ⁴ ; MA typically smoked ^{4 226} , although injection common among IDUs in Bangkok ²²⁴ Detected in 9% of unnatural deaths ²⁴⁷
The Taiwan Province of China [#]	0.6% ²³³ 0.4% students ²⁴⁸	2005 2003	29% treatment entrants ²³³	2006	--		--		23% non-IDU prison users, ¹⁵²	2005	Detected in 6% of forensic fatalities 1991-6 ²⁴⁹ ; HIV increasing among IDUs ²³³ ; MA typically smoked ⁴
Timor Leste	--		--		--		--		--		
Viet Nam	0.2% ³	2003	--		--		--		--		Second largest drug problem in (pill form) ⁴ ; MA usually swallowed ⁴

NOTES: LT = lifetime; [#]not a UN member state; SW = sex workers; F = female; M = male; IDU = injecting drug use

4.3. South Asia

The current prevalence of meth/amphetamine use in South Asia appears to be much less than that in East and South East Asia (Table 4).

Although it is one of the world's largest producers of pseudoephedrine, availability and use of meth/amphetamine appears limited in **India**. Trafficking of pseudoephedrine from the north-east of India into Myanmar and transport of meth/amphetamine back into India is believed to occur²⁵⁰ and seizures have been reported²⁵¹. Even among a sample of "drug users" in 2004, no use was occurring²³⁷ but later studies have reported a limited amount of use in the north eastern states²⁵⁰. However should availability and use increase there is cause for concern given that IDU is the main risk factor for HIV infection in the north-east of India²⁰¹.

Meth/amphetamine use has been reported to occur in **Bangladesh**²⁵²⁻²⁵⁴ and seizures of small amounts of the drug²⁵⁵ have been reported in the press. Use appears to be confined to oral use and smoking at present²⁵².

In **Iran**, most drug use involves opioids, although there have been seizures of crystal methamphetamine (66kg entering from **Afghanistan** in 2005)²⁵⁶ and ecstasy use is reportedly increasing. Minimal meth/amphetamine use has been reported: no use among psychiatric inpatients²⁵⁷, cardiology patients²⁵⁸ or nephrology patients²⁵⁹; among "drug users", 1% reported meth/amphetamine use²³⁷. Most drug use in Iran is through non-injecting routes of administration²⁶⁰, but HIV is prevalent and increasing among IDUs – 24% in 2004^{261 262}. There have been increases in injection, and evidence suggests that younger users are those most likely to make this transition²⁶⁰. A recent study of heroin users found that injecting transitions were made because of difficulties hiding smoking, and stigma surrounding smoking as a route of administration²⁶³.

Data is scarce but limited use is understood to occur in **Bhutan**⁴ according to a World Bank report²⁶⁴. This needs to be verified. There is also evidence that meth/amphetamine has been imported into India from **Afghanistan**²⁵⁰ but there are few reports of use of the drug locally.

Table 4: Data on meth/amphetamine use, injection and HIV in South Asia, by country

South Asia	MA use in general population	Year	MA use in at risk populations	Year	% IDU among MA users	Year	% MA IDU HIV+	Year	% MA IDU HCV+	Year	Comments
Afghanistan	--		--		--		--		--		No reports, possibly negligible ²⁴²
Bangladesh	--		--		--		--		--		Smoking and oral use of methamphetamine reported to occur ²⁵²
Bhutan	--		--		--		--		--		Use reported to be growing ²⁶⁴ ; IDU apparently uncommon, but sexual norms liberal, and gonorrhoea estimated at 2% of the population ²⁶⁴
India	0.02% ³	2001	0% among "drug users" ²³⁷	2004	--		--		--		Some availability ^{237 250} ; Largest producer of ephedrine, pseudoephedrine; IDU occurring and HIV/HCV highly prevalent ²³³
Islamic Republic of Iran	0% high school students ²⁶⁵		1% among "drug users" ²³⁷	2004	--		--		--		MA seized in 2005 ²⁵⁶ ; No MA use among IDUs ²⁶⁶ ; HIV increasing among IDUs ^{261 262}
Maldives	--		--		--		--		--		
Nepal	--		--		--		--		--		
Pakistan	--		0% drug users ²³⁷	2004	--		--		--		Negligible availability and use ²³⁷
Sri Lanka	--		--		--		--		--		Probably negligible

NOTES: LT = lifetime; *not a UN member state; SW = sex workers; F = female; M = male; IDU = injecting drug use

4.4. Caribbean

Very limited data were available on the epidemiology of meth/amphetamine use in the Caribbean (Table 5). The existing data available strongly suggest that use is negligible^{267 268}. Injecting drug use in general is thought to be negligible in the Caribbean with the exception of **Bermuda** and **Puerto Rico**^{269 270}.

In 2006, adult HIV prevalence in the Caribbean region was estimated at 1.2%²⁶⁹; UNAIDS estimated that 250,000 persons are living with HIV, of whom 27,000 became infected in 2006²⁰¹. AIDS was also estimated to be one of the leading causes of death among young adults in the region. The epidemic is concentrated in **Haiti** and the **Dominican Republic**, accounting for three quarters of people living with HIV in the Caribbean²⁶⁹. Generalised epidemics (greater than 1% prevalence) have been documented in the **Bahamas**, **Barbados**, **Jamaica** and **Trinidad and Tobago**²⁶⁹.

Injecting is thought to account for a very small minority of HIV infections in the region, with transmission largely through heterosexual and homosexual routes^{201 269}. In **Bermuda**, however, IDU is thought to be a more important cause of HIV infection²⁶⁹. In the **Commonwealth of Puerto Rico** HIV prevalence is very high among IDUs generally (20-25%)²⁰¹. In a cohort study of male IDUs with AIDS, 29% used meth/amphetamine (cocaine and heroin were much more commonly used)²⁷¹. HIV and drug treatment coverage appear low, with minorities receiving treatment for these problems²⁷².

Table 5: Data on meth/amphetamine use, injection and HIV in the Caribbean, by country

Caribbean	MA use in general population	Year	MA use in at risk populations	Year	% IDU among MA users	Year	% MA IDU HIV+	Year	% MA IDU HCV+	Year	Comments
Antigua and Barbuda	--		--		--		--		--		
Bahamas	0.3% ³ 0% students ²⁶⁷	2003 2003	--		--		--		--		
Barbados	0.2% ³		--		--		--		--		
Commonwealth of Puerto Rico[#]	--		29% among AIDS patients ²⁷²	2000	--		--		--		Cocaine more prevalent but use clearly occurring and the area considered a "high drug traffic" area; HIV and drug treatment coverage low ²⁷¹
Cuba	--		--		--		--		--		
Dominica	--		--		--		--		--		
Dominican Republic	1.1% ³ 1% LT students ²⁶⁸	2003 2000	--		--		--		--		
Grenada	0.7% ³	2005	--		--		--		--		
Haiti	--		--		--		--		--		
Jamaica	--		--		--		--		--		
Saint Kitts and Nevis	--		--		--		--		--		
Saint Lucia	--		--		--		--		--		
Saint Vincent & Grenadines	--		--		--		--		--		
Trinidad and Tobago	0.8% ³	2002	--		--		--		--		

NOTES: [#]dependent territory not a separate UN member state; LT = lifetime; SW = sex workers; F = female; M = male; IDU = injecting drug use

4.5. Latin America

Latin America is largely defined by its lack of meth/amphetamine use (Table 6), probably explained by importance of cocaine in most countries in the region. Two countries where meth/amphetamine use was noted as an issue were **Mexico** and **Brazil**.

HIV transmission in this region is also largely thought to be concentrated in sexual transmission²⁴⁰. HIV prevalence is varied but elevated among female sex workers in the region²⁰¹ and widespread unprotected sex between men is also thought to be an important cause of HIV transmission.

Production of meth/amphetamine has increased dramatically in **Mexico** in the past decade, and it may be producing up to 70% of the meth/amphetamine consumed in the United States market²⁷³. Domestic consumption is also increasing, and reflected in increased treatment admissions for meth/amphetamine dependence, which accounted for 25% of all drug treatment episodes in 2003²⁷⁴. Meth/amphetamine smoking has increased among meth/amphetamine treatment entrants from 45% in 1997 to 71% in 2003, with around 2-3% injecting the drug²⁷⁴. Meth/amphetamine use is most common in north-western Mexico, which is known for meth/amphetamine trafficking²⁷³, but is emerging in north-eastern Mexico¹⁹⁶. Meth/amphetamine users in Tijuana report inhaling meth/amphetamine in hollowed out light bulbs known as “focus”, and IDUs often mix heroin with meth/amphetamine or cocaine, possibly when the purity of these drugs is perceived to be low. In Tijuana, use of coloured meth/amphetamine by IDU was associated with more frequent abscesses, which may be a proxy indicator of the drug’s purity²⁷⁵. Mexican female sex workers using meth/amphetamine have been found to have higher rates of sexual risk than non-users, and 16% of those who injected drugs were HIV positive²⁷⁶.

In **Brazil**, IDU has been an important HIV transmission route, but sexual transmission has accounted for increasing proportions of new cases in recent years²⁰¹. This may be due to a switch by cocaine injectors to smoking crack cocaine in recent years²⁰¹. A study of long distance truck drivers in Brazil found high rates of sexual risk behaviours, and meth/amphetamine use was occurring commonly among this group¹⁹⁷. Truck drivers typically had unprotected sex with several partners, including sex workers and truck stop employees. Use of both alcohol and meth/amphetamine (66%) was frequent among truck drivers and the authors reported that this drug use was associated with unsafe sex practices²⁷⁷. In another study of truck drivers, groups perceived their HIV risk as low in spite of being engaged in high-risk

sexual activity, and drug knowledge was reportedly low, as was access to health services and HIV interventions¹⁹⁷.

Generalised HIV epidemics (greater than 1% prevalence) have been documented in **Guyana** and **Suriname**²⁶⁹ but no reports of significant meth/amphetamine use were located.

Table 6: Data on meth/amphetamine use, injection and HIV in Latin America, by country

Latin America	MA use in general population	Year	MA use in at risk populations	Year	% IDU among MA users	Year	% MA IDU HIV+	Year	% MA IDU HCV+	Year	Comments
Argentina	0.6% ³	2005	--		--		--		--		MA IDU presumed negligible ²⁷⁸ ; IDU historically a major cause of HIV and HCV ²⁷⁸⁻²⁸¹ but now heterosexually transmitted ²⁸²
Belize	--		--		--		--		--		MA IDU presumed negligible; IDU not a cause of HIV ^{269 283}
Bolivia	0.3% ³	2003	--		--		--		--		MA IDU presumed negligible ²⁸⁴ ; IDU not a major HIV cause ^{278 284}
Brazil	0.7% ³	2005	66% of truck drivers ²⁷⁷	2005	--		--		--		IDU a major cause of HIV, sexual transmission increasing ^{201 283}
Chile	0.4% ³	2004	--		--		--		--		MA IDU presumed negligible ²⁸²
Colombia	0.5% ³	2005	--		--		--		--		MA IDU presumed negligible ²⁸³ ; high IDU HIV risk ²⁸³
Costa Rica	1.0% ³ 2% LT students ²⁶⁸	2000 2000	--		--		--		--		IDU not a major cause of HIV ²⁸³
Ecuador	0.2% ³	2005	--		--		--		--		MA IDU presumed negligible ²⁸⁵ ; IDU not a major cause of HIV ²⁸³
El Salvador	3% ³	2005	--		--		--		--		MA IDU presumed negligible, HIV largely heterosexually transmitted ²⁸⁶
Guatemala	0.9% ³ 1% LT students ²⁶⁸	2005 2000	--		--		--		--		
Guyana	--		0% sex workers ²⁸⁷	1997	--		--		--		MA use appears negligible ^{287 288} ; IDU not a major cause of HIV, but HIV prevalent among sex workers ²⁶⁹
Honduras	0.8% ³ 3% LT students ²⁷¹	2005 2000	--		--		--		--		
Mexico	0.1% ³	2002	14% of treatment entrants ²⁷⁴	2003	3% treatment entrants ²⁷⁴	2003	--		--		Production, use increasing ²⁷³ ; IDU an increasing cause of HIV ²⁸³ ; MA typically smoked ²⁷⁴
Nicaragua	0.8% ³ 4% LT students ²⁶⁸	2003 2000	--		--		--		--		
Panama	0.6% ³ 1% LT students ²⁶⁸	2003 2000	--		--		--		--		IDU not a major cause of HIV ²⁸³
Paraguay	0.5% ³	2005	--		--		--		--		MA IDU presumed negligible ²⁸³ , but IDU an important cause of HIV ²⁰¹
Peru	0.1% ³	2005	--		--		--		--		IDU not a major cause of HIV

Latin America	MA use in general population	Year	MA use in at risk populations	Year	% IDU among MA users	Year	% MA IDU HIV+	Year	% MA IDU HCV+	Year	Comments
Suriname	0.6% ³	2002									
Uruguay	0.1% ³	2004	--		--		--		--		MA IDU presumed negligible ²⁸³ ²⁸⁹ ; IDU an important cause of HIV ^{201 283}
Venezuela	0.6% ³	2002	--		--		--		--		HIV heterosexually driven

NOTES: LT = lifetime; SW = sex workers; F = female; M = male; IDU = injecting drug use

4.6. Oceania and the Pacific

In most countries of Oceania there was limited or no data on meth/amphetamine use^{290 291}, and use was presumed negligible (Table 7). Exceptions are Australia, New Zealand, the United States territory of Guam, and Samoa. In the **United States territory of Guam** and **Samoa**, meth/amphetamine use has been of particular concern for some years. One in four Guam school students had been offered crystal methamphetamine in 1998²⁹². In 1998, half of all treatment episodes in Guam were for meth/amphetamine²⁹³. No data were available on HIV prevalence.

In **Australia**, there appears to have been an increase in both importation and local manufacture of meth/amphetamine^{294 295}. Data on the population prevalence over the past decade do not indicate an increase in overall numbers using any form of the drug, but there is good evidence that the forms being used have changed quite markedly over that period²⁹⁶. Clear increases in crystal methamphetamine use have occurred among sentinel groups of regular drug users. Frequent crystal methamphetamine use among regular IDUs is associated with earlier initiation to injecting, greater injection risk behaviours, and more extensive criminal activity²⁹⁴, psychotic symptoms²⁹⁷ and dependence^{62 298}. Indicators of meth/amphetamine-related harm appear to have recently stabilised, following steady increases over the past decade.

Rates of HIV are low among IDUs in **Australia**. Three per cent of IDUs injecting meth/amphetamine are HIV positive; rates are higher among indigenous IDUs¹⁵⁴. Concerns have been raised about links between meth/amphetamine use and unsafe sexual activity among MSM in Australia (who comprise the bulk of prevalent and incident HIV infections²⁹⁹). Associations have been repeatedly found between meth/amphetamine use and risky sexual behaviour among MSM (particularly UAIC)^{7 11 21 128}, but no association has been found with HIV seroconversion and some studies have not found an association in multiple regression analyses¹⁰⁷. Evidence suggests that meth/amphetamine use is a strong marker for engagement in a range of highly risky sexual practices¹⁰⁸, and that changes in HIV risk perception¹²⁰ may have played a role in increased UAIC^{300 301}.

In **New Zealand**, similar increases have occurred in meth/amphetamine use over the past decade. The use of “pure” or “P” (the local term for crystal meth/amphetamine) has been linked to violent behaviour and significant community concern; in 2004, meth/amphetamine accounted for 10% of treatment episodes in the country³⁰². Use is common among sentinel

groups of drug users, and is usually smoked. Injection of the drug is common among IDUs (70%)³⁰³. Self-reported HIV prevalence among users is 3%.

Table 7: Data on meth/amphetamine use, injection and HIV in Oceania and the Pacific, by country

Oceania and the Pacific	MA use in general population	Year	MA use in at risk populations	Year	% IDU among MA users	Year	% MA IDU HIV+	Year	% MA IDU HCV+	Year	Comments
American Samoa [#]	--		--		--		--		--		Major drug of concern ³⁰⁴ ³⁰⁵ ; Smoking main route ³⁰⁵
Australia	3.4% ³⁰⁶ 3% students ²⁹⁴	2004 2006	56% IDU ²⁹⁸ ; 56% ecstasy users ³⁰⁷ ; 26% MSM ³⁰⁸	2006 2006 2006	18% gen. pop. users ²⁹⁴ ; 12% of ecstasy users ²⁹⁴ ; 69% of IDU ²⁹⁴ ; 63% regular users ⁶²	2004 2006 2006 2004	3% IDU ³⁰⁹	2006	45% IDU ³⁰⁹	2006	
Federated States of Micronesia	--		--		--		--		--		Possibly negligible ²⁹¹ ³¹⁰
Fiji	--		--		--		--		--		Possibly negligible ²⁹¹
French Polynesia [#]	--		--		--		--		--		Seizures have occurred ³⁰⁵
Guam [#]	7% LT students ²⁹³	1999	50% of treatment entrants ²⁹³	1998	--		--		--		Primary drug problem for the country ²⁹¹ ²⁹³
Kiribati	--		--		--		--		--		Possibly negligible ²⁹¹
Marshall Islands	--		--		--		--		--		Possibly negligible ²⁹¹
Nauru	--		--		--		--		--		Possibly negligible ²⁹¹
New Caledonia [#]	--		--		--		--		--		Possibly negligible ²⁹¹
New Zealand	4% ³¹¹	2003	10% of treatment entrants ³⁰²	2004	28% of regular users ³⁰³ ; 70% of IDU ³⁰³	2006 2006	3% regular users ³⁰³ *	2006	16% regular users ³⁰³ *	2006	
Palau	--		--		--		--		--		Use reported as increasing ³⁰⁵ ; Seizures have occurred ³⁰⁵
Papua New Guinea	--		--		--		--		--		Use thought to be increasing ³⁰⁵ ; HIV largely heterosexual transmission, little IDU ²⁰¹
Samoa	--		--		--		--		--		Major drug of concern ³⁰⁴ ³⁰⁵ ; Smoking main route ³⁰⁵
Solomon Islands	--		--		--		--		--		Possibly negligible ²⁹¹
Tonga	--		--		--		--		--		Possibly negligible ²⁹¹
Tuvalu	--		--		--		--		--		Possibly negligible ²⁹¹
Vanuatu	--		--		--		--		--		Possibly negligible ²⁹¹

NOTES: [#]dependent territory not a separate UN member state; LT = lifetime; SW = sex workers; F = female; M = male; IDU = injecting drug use; * based on self-report only

4.7. Canada, United States and Western Europe

These regions were notable for the greater breadth and depth of data on the epidemiology of use and harm related to meth/amphetamine compared to other regions (Table 8). Meth/amphetamine use is an established and perhaps growing problem in numerous countries.

The country with perhaps the largest and most concerning problem related to meth/amphetamine use is the **United States**. Meth/amphetamine accounted for 10% of emergency department drug related visits¹⁸⁹ and 9% of drug treatment episodes in 2005³¹² and is increasing²⁷⁴. Smoking is emerging as a route of administration: the percentage of new meth/amphetamine clients who reported smoking increased from 22% in 1996 to 56% in 2003, and the proportion injecting the drug declined from 29% to 21%²⁷⁴. This is consistent with the possibility of a new cohort of users making a transition to dependent use through smoking. There is evidence to suggest that where the crystal form of the drug is more widely available, problems related to meth/amphetamine use are more severe¹⁸⁹. In many instances, problematic users come from rural areas that have been relatively poorly able to cope with the attendant problems related to dependent use. Rural meth/amphetamine treatment clients are both younger and more likely to be injecting the drug (37% versus 21%) than urban clients³¹³.

Of concern are the high rates of HCV and HIV among dependent users in the **United States**. Those injecting the drug are less likely than other IDUs to attend outreach services, but have higher rates of injecting risk behaviours⁸⁰, making the need for innovative programmes to reach this population vital. In one NSP sample of IDUs, factors independently associated with injecting risk behaviour included meth/amphetamine injection, homelessness, depression, and having a recent same-sex sexual partner⁸⁰. Female injectors have been found to have higher rates of HCV than males^{79 314}. Among MSM in San Francisco, meth/amphetamine users had higher HIV incidence rates (6.3% versus 2.1%) but the association did not remain after controlling for confounders³¹⁵.

In **Canada**, crystal methamphetamine injection is uncommon among older IDUs (7%); in one cohort it was independently associated with syringe borrowing and lending, but not with unprotected sex or sex work³¹⁶. Meth/amphetamine use appears to be a greater issue among younger age groups^{316 317}; between 2001 and 2005 it was an issue for one-quarter of adolescent drug treatment entrants in one clinic³¹⁸. Limited data suggest that problems related to this drug use are increasing in Canada.

In **Austria**, meth/amphetamine use appears to be increasing among younger people, and injecting is common among treatment entrants (42%)³¹⁹ (“treatment entrants” in this instance refer to those entering treatment for opioid substitution therapy). This is of concern as HIV infections have been concentrated among younger drug users in recent years³¹⁹; prevalence estimates of around 50% for HCV and 0-6% HIV have been found among samples of drug users, although not related to meth/amphetamine specifically³¹⁹.

A significant problem related to meth/amphetamine has also been noted in Sweden. Meth/amphetamine was common among drug treatment entrants (35%) and “problem drug users” (39%), and 90% of these users may inject the drug³²⁰. In 2003, 88% of IDUs injecting the drug were found to be HCV positive⁴¹. Meth/amphetamine is commonly detected in traffic fatalities³²¹.

In **Belgium**, 11% of calls to drug telephone-helplines were about meth/amphetamine in 2004³²², although meth/amphetamine did not rank highly as a drug of concern in drug treatment centres³²². Low rates of use were found among sex workers. HIV and HCV rates among IDUs in general are 7% and 35-79% respectively, and HIV incident infections among this group appear to be declining³²².

In **Germany**, treatment episodes for meth/amphetamine use have increased over the past decade from 2% in 1994 to 10% of all first-time outpatient drug treatment episodes (and 4% of inpatient episodes) in 2004³²³. Smoking and snorting were reportedly the most common routes of administration. HIV is not prevalent among IDUs generally (less than 5% in 2004), and HCV prevalence is 43%³²³.

In **Denmark**, there is evidence that meth/amphetamine problems may be increasing. In 2004, one quarter of first time drug treatment entrants were for meth/amphetamine; there is increasing evidence of greater treatment need among young adults for this drug use³²⁴. No estimates were available on the prevalence of HIV or HCV among meth/amphetamine injectors and the only prevalence study with IDUs was conducted in 1997.

Concerns about increased problems related to meth/amphetamine use were voiced in southern **Italy** by clinicians a decade ago³²⁵ and a recent novel examination of metabolites in wastewater from Milan confirmed high levels of meth/amphetamine use in that population³²⁶. Population surveys have suggested increasing use, which is clearly concentrated among some populations of young people (Table 8).

Similarly, **the Netherlands** appears to have considerable use, but it is not reflected in treatment numbers or hospital admissions³²⁷; injection of meth/amphetamine appears to be rare even among treatment populations, and the drug is not used by IDUs; most use is either by swallowing or snorting³²⁷. Users presenting for treatment are significantly younger than users of other drugs. HIV incidence due to IDU is low, with most transmission sexually driven³²⁷.

The underestimation of drug use produced by household surveys is clearly demonstrated using data from **Finland**. The household survey estimate of *any* past year use – 0.6% – is effectively the same as the estimate of *problematic* meth/amphetamine use produced using indirect prevalence estimation methods (0.4-0.6%)^{187 328}; rates are higher among younger age groups. Meth/amphetamine accounted for 26% of treatment episodes and was injected by 79% of patients in 2004³²⁸. HIV and HCV infections appear to be decreasing among IDUs in this country; prevalence among IDU generally is 4% and 67% respectively³²⁸.

In **France**, the use of meth/amphetamine does not appear to be associated with the same rate of problems: the population prevalence estimate of past year use was 0.2% (versus 0.6% for **Finland**), but meth/amphetamine accounted for only 0.7% of new drug treatment episodes in 2003³²⁹. The data for some other countries also suggested limited use and problems, including **Greece, Malta, Ireland, and Iceland**. In **Malta**, meth/amphetamine use also appears very low; HCV is prevalent, however, among current IDUs (35%) and prisoners (50%); HIV is uncommon (0% IDU, 1.3% prisoners)³³⁰.

In the **United Kingdom**, use of this drug was recently reported as low and stable. HIV prevalence among IDUs generally is less than 1%; HCV prevalence was around 45% in 2004 and incidence is reportedly increasing³³¹. Levels of use are higher among some groups including MSM (both those who are HIV positive and HIV negative)³³².

Limited or no data were available to assess the state of affairs in numerous countries including **Albania, Andorra, Monaco, Montenegro, Liechtenstein, and Macedonia**.

As a general comment, many countries in Europe have relatively good availability of cocaine. It may well be the case that this serves to contain the availability and/or use of meth/amphetamine (through user preferences, supply control on the part of drug distributors, or both).

Table 8: Data on meth/amphetamine use, injection and HIV in Canada, United States and Western and Central Europe, by country

	MA use in general population	Year	MA use in at risk populations	Year	% IDU among MA users	Year	% MA IDU HIV+	Year	% MA IDU HCV+	Year	Comments
Albania	0.02% ³	2004	--		--		--		--		
Andorra	--		--		--		--		--		
Austria	0.8% ¹⁸⁷ 1.5% 15-34yrs ¹⁸⁷	2004 2004	--		42% in treatment ³¹⁹	2004	--		--		HIV increasing among younger users ³¹⁹
Belgium	0.8% ³ 1.3% students ³²²	2001 2003	5% sex workers ³²² ; 16% of IDU ³²²	2001 2004	18-30% drug users ³²²	2004	--		--		Not mentioned as a common drug in treatment setting ³²²
Canada	0.8% ³	2004	7% of IDU ³¹⁶ ; 48% at raves ³³³ ; 27% of adolescent treatment entrants ³¹⁸	2004 2003 2001-5	--		--		--		Little documented trends ³³⁴ ; reports of increasing MA use ³³⁵ perhaps concentrated among younger persons ³¹⁷
Denmark	1.3% ¹⁸⁷ 3.1 % 15-34yrs ¹⁸⁷ 6% LT students ³²⁴	2000 2000 2004	12% treatment entrants ¹⁸⁷	2004	1.3% treatment entrants ¹⁸⁷	2004	--		--		Problems higher among people under 30yrs ³²⁴
Finland	0.6% ¹⁸⁷ 1.3% 15-34yrs ¹⁸⁷ 0.4-0.6% dep. use ³²⁸	2004 2004 2002	29% treatment entrants ¹⁸⁷	2004	69% treatment entrants ¹⁸⁷	2004	--		--		HIV and HCV incidence reportedly declining ³²⁸
France	0.2% ¹⁸⁷ 0.4% 15-34yrs ¹⁸⁷ 1.8% students ³²⁹	2000 2000 2003	0.3% treatment entrants ¹⁸⁷	2003	--		--		--		HIV largely transmitted through sexual routes ³²⁹ ; HIV and HCV estimated at 4% and 55% among IDUs ³²⁹
Germany	0.9% ³²³ 2.4% students ³²³ 2.2% 15-34yrs ¹⁸⁷	2004 2003 2003	6% of treatment entrants ³²³	2004	--		--		--		MA usually smoked or snorted; HIV epidemic reportedly stable ³²³
Greece	0.02% ³ 0.1% 15-34yrs ¹⁸⁷	2004 2004	<1% of treatment entrants ³³⁶ ; 11% use disorder – male prisoners ³³⁷	2004 2000	28% prisoners ³³⁷	2000	0% prisoners ³³⁷	2000	--		Presumably negligible ³³⁶
Iceland	0.9% ³	2003	--		--		--		--		Not detected in drug deaths in 2002 ³³⁸
Ireland	0.9% ³ 1.5% 15-34yrs ¹⁸⁷	2004 2002-03	<1% of treatment entrants ³³⁹	2004	5% treatment entrants	2003	--		--		
Italy	0.6% ³⁴⁰ 0.4% 15-34yrs ¹⁸⁷	2003 2003	13% music event attendees ³⁴¹ ; 0.1% treatment entrants ¹⁸⁷	2004 2004	0% treatment entrants	2004	--		--		Detected in 7% injured drivers ³⁴² ; HIV increasingly sexually transmitted, IDU reducing ³⁴³ ; prevalence declining among IDU ³⁴⁴ ; HCV stable and endemic ³⁴⁰
Liechtenstein	0.2% ³	2005									

	MA use in general population	Year	MA use in at risk populations	Year	% IDU among MA users	Year	% MA IDU HIV+	Year	% MA IDU HCV+	Year	Comments
Luxembourg	0.4% ³ 2.2% students ³⁴⁵	1999 2000	3% of treatment entrants ³⁴⁵	2004			--		--		Use thought to be increasing, no data on injecting ³⁴⁵ ; HIV among IDU 5% and decreasing, HCV increasing and 74% ³⁴⁵
Malta	0.3% ³ 0.0% ¹⁸⁷	2001 2001	0.7% treat entrants ¹⁸⁷	2004	--		--		--		Use appears low ³³⁰
Monaco	--		--		--		--		--		
Montenegro	--		--		--		--		--		Domestic production has been detected ³
Netherlands	0.6% ¹⁸⁷ 1.2% 15-34yrs ¹⁸⁷ 2.2% LT students ³²⁷	2001 2001 2003	6% treatment entrants ¹⁸⁷ ; 1% of problem drug users ³²⁷	2004 2003	2% treatment entrants ¹⁸⁷	2004	--		--		MA use common among "school drop outs" and juvenile detainees ³²⁷ ; problem 80% of MA users in treatment less than 30yrs ³²⁷ ; MA snorted (59%) and swallowed (26%) ³²⁷ ; HIV incidence low
Norway	1.1% ¹⁸⁷ 2.0% 15-34yrs ¹⁸⁷ 3.5% LT students ³⁴⁶	2004 2004 2004	9% treatment entrants ³⁴⁶	2004	12% of IDU ³⁴⁶		--		--		Use stable or increasing ³⁴⁶ ; MA commonly detected in drug drivers ³⁴⁶⁻³⁴⁸ and 4% of drug deaths ³³⁸ ; MA IDU may be uncommon ³⁴⁶ ; HIV rare but HCV common among IDUs ³⁴⁶
Portugal	0.1% ¹⁸⁷ 2% past month university ³⁴⁹	2001 2000	--		--		--		--		Not mentioned as a drug of concern in treatment statistics or clients ^{350 351} ; MA detected in 3% of drug deaths ³⁵⁰ ; among IDU generally HIV 13% and HCV 44% ³⁵⁰
San Marino	--		--		--		--		--		
Serbia	--		--		--		--		--		Domestic production has been detected ³
Slovenia	0.2% ³	1999	90% of "synthetic drug users" ³⁵² ; 0.2% treatment entrants ¹⁸⁷	2004 2004	--		--		--		Not reported as a drug of concern in treatment settings ³⁵² ; MA typically swallowed or snorted ³⁵² ; <1% HIV and 23% HCV among IDUs generally ³⁵²

	MA use in general population	Year	MA use in at risk populations	Year	% IDU among MA users	Year	% MA IDU HIV+	Year	% MA IDU HCV+	Year	Comments
Spain	1.0% ³ ; 1.6% 15-34yrs ³⁵³ ; 3.3% students ³⁵³	2005 2003 2003	1% treatment entrants ¹⁸⁷	2002	6.0% treatment entrants ¹⁸⁷	2002	--		--		Sporadic use among young people, stable ³⁵³ ; Not a major drug in treatment settings, rarely detected in overdoses ³⁵³ ; HIV (31%) and HCV among IDU very high but HIV incidence decreasing ³⁵³
Sweden	0.2% ³ ; 3% LTconscripts ³²⁰	2000 2005	28% treatment entrants ¹⁸⁷ ; 39% problem drug users ³²⁰	2004 2005	90% problem users ³²⁰ ; 40% treatment entrants ¹⁸⁷	2005 2004	--		88% ³⁵⁴	2003	Common among problematic users ³⁵⁵ but pop size seems low ³²⁰ ; 10% fatally injured drivers ³²¹ and 12% of drug deaths ³³⁸
Switzerland	0.8% ³	2003	--		--		--		--		detected in 4% of drug drivers ³⁵⁶
The Former Yugoslav Republic of Macedonia	--		--		--		--		--		
United Kingdom	1.2% students ³⁵⁷ 1.5% ¹⁸⁷ 2.9% 15-34yrs ¹⁸⁷	2006 2004 2004	13% HIV+ MSM ³³² ; 8% HIV- MSM ³³² ; 5% treatment entrants ¹⁸⁷ ; 75% prison entrants ³⁵⁸	2003 2003 2004 1995	27% treatment entrants ¹⁸⁷	2004	--		--		Use and problems thought to be low ³³¹ ; HIV low among IDU generally (<1%), HCV around 40% ³³¹
United States	1.8% ³ 3.9% 16-25yrs ³⁵⁹	2005 2003	9.2% of treatment entrants ³¹² ; 10% MSM ³¹⁵	2005 2001 /2	3% gen pop users ³⁶⁰ ; 21% treatment entrants ²⁷⁴	1998 2003	9% F IDU ⁷⁹	2004	44% ³¹⁴ ; 75% F IDU ⁷⁹	2002 2004	Sustained and concentrated problem throughout many states, spreading from West to East; crystal form common in the West and powder increasing in the Midwest ¹⁸⁹ ; mentioned in 10% of ED visits ¹⁸⁹

NOTES: LT = lifetime; SW = sex workers; F = female; M = male; IDU = injecting drug use

4.8. Middle East and Northern Africa

There was little data on meth/amphetamine use in this region (Table 9). Khat predominates in many countries in the Middle East and Africa³⁶¹ – in **Yemen** e.g., 60% reportedly use the drug “frequently”³⁶². Khat plant leaves (*Catha edulis forsk*) are chewed – these contain an active psychostimulant substance known as Cathinone, which is similar to amphetamine in both its structure and activity³⁶³⁻³⁶⁶.

Meth/amphetamine precursor chemicals are produced in the **United Arab Emirates** and seizures of meth/amphetamine have been reported in **Cyprus**³⁶⁷.

Limited anecdotal media reports in **Saudi Arabia** suggest that use and problems are occurring in this country³⁶⁸. No direct data could be obtained on meth/amphetamine use in **Iraq**, but there have been media reports of heavy use among Iraqi military personnel fighting in the current Iraq war^{369 370}. In **Lebanon**, there have been reports of meth/amphetamine use concentrated among “high income” members of the population³⁷¹.

Table 9: Data on meth/amphetamine use, injection and HIV in the Middle East and Northern Africa, by country

Middle East and Northern Africa	MA use in general population	Year	MA use in at risk populations	Year	% IDU among MA users	Year	% MA IDU HIV+	Year	% MA IDU HCV+	Year	Comments
Algeria	--		--		--		--		--		
Bahrain	0.1% ³	2005	--		--		--		--		IDU a major cause of HIV transmission ³⁷² with 20% of IDUs HIV+ ³⁷³
Cyprus	0.2% ³	2003	--		--		--		--		Seizures have occurred ³⁶⁷
Egypt	0.5% ³	2006	--		--		--		--		
Iraq	--		--		--		--		--		
Israel	0.4% ³	2005	1% high risk adolescents ³⁷⁴	2003	--		--		--		
Jordan	0.4% ³	2001	--		--		--		--		
Kuwait	0.3% ³ 0.2% urine positive conscripts ³⁷⁵	2005 1990	5% general practice ³⁷⁶		--		--		--		
Lebanon	0.4% ³	2001	--		--		--		--		Reports of availability and use among "high income recreational users" ³⁷¹
Libyan Arab Jamahiriya	--		--		--		--		--		
Morocco	0.02% ³	2004	--		--		--		--		
Oman	0.1% ³	1998	--		--		--		--		
Qatar	0.02% ³	1996	--		--		--		--		
Saudi Arabia	0.002% ³	2000	10% treatment sample ³⁷⁷		--		--		--		Reports of increasing problematic use in the Eastern provinces ³⁶⁸
Sudan	--		--		--		--		--		
Syrian Arab Republic	0.003% ³	1998	--		--		--		--		61% HCV among IDUs ³⁷⁸
Tunisia	--		--		--		--		--		
Turkey	0.2% ³	2003	0% psychiatric outpatients ³⁷⁹		--		--		--		
United Arab Emirates	--		--		--		--		--		IDU reportedly increasing ³⁸⁰ ; Precursor chemicals produced here
Yemen	--		--		--		--		--		Khat widely used – 80% of men and 60% of women use it frequently ³⁶²

NOTES: LT = lifetime; SW = sex workers; F = female; M = male; IDU = injecting drug use

4.9. Sub-Saharan Africa

Data are notably absent for this region (Table 10), but meth/amphetamine use is presumably negligible in most countries, with the exception of **South Africa**. Khat has been used widely in some countries (e.g. 37% in Ethiopia³⁸¹), and has been associated with psychosis³⁸²⁻³⁸⁴ and with risky sexual behaviour among school students³⁸⁵.

Traditionally, injecting drug use has not been widespread in Sub-Saharan Africa, although it has been increasing in some East-African countries. HIV prevalence is among the highest in the world in this region, with transmission typically sexual²⁴⁰.

In **South Africa**, meth/amphetamine is called “tik”. Its use is concentrated among young people, and is rapidly increasing^{190 386}. Methamphetamine was used by 45% of drug treatment entrants in 2005, with 41% using daily. Injecting was rare among this population (<5%), with smoking typical (90%)¹⁹⁰.

However, the implications of meth/amphetamine use for HIV transmission are considerable. HIV prevalence *in the general population* in **South Africa** is 19% and thought to be increasing; rates are four times higher among girls than boys aged 15-24 years²⁴⁰. There appear to be associations between meth/amphetamine use and sexual risk behaviour among young people, drug users and sex workers. One study found that sexual risk in general was considered by young people to be related to girls’ limited power in sexual relationships, and boys’ perceived invulnerability to HIV infection and the cache derived from having multiple partners; drug use was thought to affect adolescents’ inhibitions and the capacity to negotiate safer sex³⁸⁷. A study of South African adults found that poverty-related stressors were important predictors of HIV risk behaviours among drug users³⁸⁸ and female sex workers found that relationships with men affected both sexual and drug risk behaviours³⁸⁹.

Table 10: Data on meth/amphetamine use, injection and HIV in Sub-Saharan Africa, by country

Sub-Saharan Africa	MA use in general population	Year	MA use in at risk populations	Year	% IDU among MA users	Year	% MA IDU HIV+	Year	% MA IDU HCV+	Year	Comments
Angola	--		--		--		--		--		
Benin	--		--		--		--		--		
Botswana	--		--		--		--		--		
Burkina Faso	--		--		--		--		--		
Burundi	--		--		--		--		--		
Cameroon	0.9% ³	1999	--		--		--		--		Considered a commonly used drug in mid 1990s ³⁹⁰
Cape Verde	--		--		--		--		--		
Central African Republic	--		--		--		--		--		
Chad	0.01% ³	1996	--		--		--		--		
Comoros	--		--		--		--		--		
Côte d'Ivoire	--		--		--		--		--		
Democratic Rep. of Congo	--		--		--		--		--		
Djibouti	--		--		--		--		--		
Equatorial Guinea	--		--		--		--		--		
Eritrea	--		--		--		--		--		
Ethiopia	0.3% ³	2006	--		--		--		--		
Gabon	--		--		--		--		--		
Gambia	--		--		--		--		--		
Ghana	1.0% ³	2006	--		--		--		--		
Guinea	--		--		--		--		--		
Guinea-Bissau	--		--		--		--		--		
Kenya	0.6% ³	2006	--		--		--		--		
Lesotho	--		--		--		--		--		
Liberia	--		--		--		--		--		
Madagascar	--		--		--		--		--		
Malawi	--		--		--		--		--		
Mali	--		--		--		--		--		
Mauritania	--		--		--		--		--		
Mauritius	--		--		--		--		--		
Mozambique	--		--		--		--		--		
Namibia	0.1% ³	2000	--		--		--		--		
Niger	--		--		--		--		--		
Nigeria	1.1% 6.7% students ³⁹¹	1999 2002	--		--		--		--		Amphetamine, ephedrine ³⁹¹
Republic of the Congo	--		--		--		--		--		
Rwanda	--		--		--		--		--		

Sub-Saharan Africa	MA use in general population	Year	MA use in at risk populations	Year	% IDU among MA users	Year	% MA IDU HIV+	Year	% MA IDU HCV+	Year	Comments
Sao Tome and Principe	--		--		--		--		--		
Senegal	--		--		--		--		--		
Seychelles	--		--		--		--		--		
Sierra Leone	--		--		--		--		--		
Somalia	--		--		--		--		--		
South Africa	0.5% ³	2005	45% of drug treatment entrants ¹⁹⁰	2005	--		--		--		MA increasing ^{74 392 398} and concentrated among young people; IDU uncommon route
Swaziland	--		--		--		--		--		
Togo	--		--		--		--		--		
Uganda	--		--		--		--		--		20% current Khat users ³⁹²
United Republic of Tanzania	--		--		--		--		--		
Zambia	0.1% ³	2003	--		--		--		--		
Zimbabwe	0.1% ³	2000	--		--		--		--		

NOTES: LT = lifetime; SW = sex workers; F = female; M = male; IDU = injecting drug use

5. Discussion

In this section we outline some broad implications of this review for interventions and future work. This desk-based literature review identified a range of issues related to the existing data – and its substantial gaps – on meth/amphetamine use, injection and the association with HIV.

Meth/amphetamine use appears to be increasing in many parts of the world. Understanding of stimulant drugs lags far behind depressant drugs, and therapeutic options are far more limited for meth/amphetamine users than for depressant drugs.

As IDUs now account for 10% of global new HIV infections, and 30% of infections outside Africa, it is imperative that more research is conducted on the relationship between HIV and meth/amphetamine. This need is particularly marked for low and middle income countries, where the bulk of meth/amphetamine users worldwide live, and yet where knowledge is most limited.

5.1. Epidemiology of use, injection and associations with HIV

There is a clear, broad imperative for research upon the epidemiology and associated harms of meth/amphetamine use. Many countries have scant or no data on the prevalence, route and form of meth/amphetamine use, let alone the prevalence of HIV and HCV among users. There is limited data available on the types of meth/amphetamine available across countries, yet this seems to be a crucial factor in determining the extent to which meth/amphetamine poses a problem within a given country or region. The associated harms of meth/amphetamine use and injection have been summarised in the beginning of this report, yet the quality and amount of data that exist on the scale of the problem – particularly in Asia where use is thought to be increasing – are exceedingly poor. This issue must be addressed if responses are to be appropriately targeted. On the basis of the current evidence, problematic meth/amphetamine use appears more prevalent in Asia, North America, a number of European countries, Mexico, South Africa New Zealand and Australia.

Better monitoring of use, risks and harm among known at-risk populations is required. It seems that problematic use tends to be concentrated within high risk groups in many

countries; population prevalence estimates of past year use are therefore of limited usefulness for providing information about the extent to which meth/amphetamine use is causing harm in a given country. Treatment data fill this gap to some extent, but do not exist in many countries, and should also not be taken to reflect accurately levels of problematic use, since users may be unlikely to present for treatment in some settings (particularly those which are targeted towards opioid users). Data on patterns of use among at-risk groups should be collected wherever possible, and reported regularly.

In terms of injecting risk, the evidence on this topic is surprisingly scant. Some studies have suggested increased likelihood of injecting risk and HIV seroconversion among meth/amphetamine injectors compared to injectors of other substances, others have not. More and better data on this issue are needed. The prevalence of HIV and HCV among meth/amphetamine IDUs is poorly documented in almost every country. Meth/amphetamine injectors (and users) appear to be a younger population than opioid users; different strategies may be required to target this group, which seems less likely to present for treatment or engage routinely with harm reduction services (see below).

Perhaps not surprisingly, given their younger age and the context of meth/amphetamine use for some users, sexual risk behaviours have been documented as more common among this group. This provides an additional avenue through which HIV and other STIs may be transmitted, and may be important where HIV transmission is occurring primarily through sexual routes (and particularly among MSM).

It is unwise to invoke overly simplistic causal explanations of the association between sexual risk and meth/amphetamine use. They are unlikely to be true. They are therefore unlikely to produce useful policy or treatment responses, given the multitude of factors which appear to influence the association.

There is much that we do not know about the comparative epidemiology of meth/amphetamine use and dependence around the world. There is a clear need for careful cross-national investigations of the epidemiology of meth/amphetamine dependence and risk factors for dependence among users. Most of what little we know is dominated by research in higher income countries, although well-conducted studies in Thailand are providing some data on risks in Asia. We do not know the extent to which data from high income countries are applicable in low and middle income countries. At this stage, we must apply existing knowledge on risks to countries without data, but these associations may differ in important ways and future work must address this gap.

5.2. The importance of form and route of administration

Available data strongly suggest that both route of administration and the form of meth/amphetamine are important factors affecting the nature and extent of harms. Although the focus of this report was upon the injection of meth/amphetamine, the data clearly showed that in countries where smoking was an important route of administration, meth/amphetamine was likely to be a problem. Smoking is an important route of administration in countries where the crystal methamphetamine form is known to be available.

Given the limited data, it is difficult to tease apart the relative contribution of these two factors (meth/amphetamine form and route) and more work is needed on this question. Recent Australian evidence suggested, however, that among a sample who were largely injecting methamphetamine, use of the crystalline form made a unique contribution to the risk of dependence⁶²; other work has suggested that those smoking but not injecting crystal methamphetamine are also at increased risk of a range of harms including dependence³⁹³ (see also Sections 1.2 and 1.3).

On the basis of data from higher income countries with established opioid use problems, meth/amphetamine users appear less likely to be injecting the drug than opioid users, and more likely to use meth/amphetamine orally or intranasally. With the advent of crystal methamphetamine, however, there has been a notable increase in smoking as a route of administration; this is the case in many Asian countries. As use becomes more entrenched, it is unclear to what extent crystal methamphetamine users will make the transition to injecting. Attention needs to be given to the possibility that such transitions will be made, particularly among dependent users. This is probably more likely where there is already an established population of injecting drug users and may be made more likely if access to smoking equipment is banned (see below). Concerns have been raised about transitions to injecting among large populations of heroin/opium smokers in countries such as Iran, and it seems prudent to be focusing attention on countries (particularly in South East Asia) where smoking methamphetamine is common, where dependent use has emerged as an issue, and where injecting of other drugs is becoming more prevalent.

5.3. Possible responses

There are a number of spheres in which interventions to reduce meth/amphetamine use and its related harms may be targeted. In this report, we intend to briefly summarise the major ways in which it may be possible to reduce meth/amphetamine use and harm. Future work could examine in detail the evidence for interventions to reduce the production, availability, use and related harms of meth/amphetamine.

5.3.1. Supply reduction

5.3.1.1. Precursor control

A review of responses to meth/amphetamine use and harm is well beyond the scope of this paper, but in many if not most countries the first response to increased availability of meth/amphetamine by governments seems to be consideration of changes in the scheduling of precursors for its manufacture. There has been examination in the United States of the impact of domestic scheduling changes upon meth/amphetamine related harms^{394 395}, with some evidence of a reduction following increased restrictions. The effects of this change in the United States have not been sustained, given that production appeared to increase in Mexico as a consequence of the United States ban on precursors.

Of course, restrictions upon availability in a country often lead to a shift by manufacturers to obtaining precursor chemicals from alternative sources. In the case of Australia in the 1990s, restrictions on precursors is thought to have led to a shift to different production methods with the result that in Australia virtually all amphetamine is now methamphetamine²⁹⁶, with more users now smoking the drug instead of snorting or swallowing it. Anecdotal reports suggest that recent restrictions upon the availability of over-the-counter cold and flu medications in Australia have led to increased pharmacy break-ins, suggesting displacement of diversion of pseudoephedrine to higher levels in the supply chain³⁰.

Attempts to control supply may limit availability but they are unlikely to permanently reduce availability or use as long as demand for the drug continues to be strong. Interventions to reduce demand and harm related to meth/amphetamine use must also be implemented.

5.3.1.2. *Laws related to drug possession or supply*

There is little available data regarding the impact of changing laws surrounding penalties for possession of small quantities of meth/amphetamine. **It is unlikely that increases in the severity of penalties for possession of meth/amphetamine will substantially reduce consumption** (based upon prior studies examining cannabis use), and **there is a risk they may further disadvantage users who are detected by police, since they are likely to already be experiencing problems related to their drug use**. We are not aware of any work evaluating the benefits (or negative consequences) of more severe penalties for supplying illicit drugs.

5.3.2. Demand reduction

5.3.2.1. *Treatment of meth/amphetamine dependence*

A wide range of interventions have been examined for the treatment of meth/amphetamine dependence^{396 397}. **There is at present no evidence of the effectiveness of agonist pharmacotherapies for meth/amphetamine dependence**^{398 399}. Interest among meth/amphetamine users in existing trial medications may also be limited³⁹⁹ and perhaps only effective in highly selected groups^{397 399}. Future research should investigate other medications.

Some evidence exists that behavioural interventions are effective in the treatment of meth/amphetamine dependence^{396 399-401}. The approaches that appear to have the greatest promise include cognitive behavioural therapy and contingency management. Manuals for such interventions have been developed by researchers in Australia and the United States^{398 402}. Guidelines have also been developed for general practitioners to identify, assess and respond to psychostimulant problems among their patients^{403 v}. Such resources should be promoted to service providers as they represent the synthesis of current evidence in this area. Much more research is needed, however, into effective behavioural approaches⁴⁰¹.

Successful reduction of drug use among dependent users has been associated with reductions in sexual risk behaviours⁴⁰⁴ **and HIV risk behaviours**^{89 405}. Presumably, HIV medication adherence might also improve if drug use is reduced (as has been found for effective treatment of heroin dependence). In a review of the issues for MSM⁴⁰⁴, three policy recommendations were made:

^v Details of the MATRIX model for meth/amphetamine treatment are available free of charge at <http://www.kap.samhsa.gov/products/manuals/matrix/index.htm>.

1. Treatment for drug dependence should simultaneously address drug use and sexual risk behaviours (see below);
2. drug treatment should be considered as a possible method of HIV prevention;
3. drug counsellors in generalist treatment settings should be educated about the specific cultural and sexual risk issues among risk populations (such as MSM)⁴⁰⁴.

It seems reasonable to recommend that these principles be extended to *all* persons in treatment for meth/amphetamine dependence. The social and psychological effects of heavy meth/amphetamine use also need to be addressed. These include the physical consequences of using crystal; problems related to the development of psychotic symptoms; and the social, financial and occupational consequences of heavy use. Treatment of meth/amphetamine dependence may increase adherence to HIV medication, which is an important consideration for HIV positive users.

5.3.2.2. *Community education*

Some have responded to meth/amphetamine and other drug use by developing education campaigns based upon promoting the risks in an emotive and dramatic fashion – so-called “fear campaigns” – derived from social marketing^{vi} principles⁴⁰⁶. They are common in the area of alcohol and drug use prevention⁴⁰⁶. This is in stark contrast to the general advertising industry, where such tactics are considered unethical⁴⁰⁶.

The evidence for the effectiveness of “fear campaigns” is far from satisfactory⁴⁰⁷. **Factually based messages are preferable, will be less stigmatising, and will avoid the tendency for biased and exaggerated messages to be accurately identified as such by those with knowledge of the drug concerned.**

5.3.3. Harm reduction

5.3.3.1. *Injecting related harm reduction*

Needle and syringe programmes have been shown to reduce HIV transmission and injecting risk behaviour. Current NSP *models* (in countries where they have been established for some time) appear to be less effective at engaging some populations of injecting drug users,

^{vi} Social marketing refers to a method used to achieve desirable behavioural change at the community level, typically involving mass marketing techniques that are used to correct misperceptions and to increase the social acceptability of a behaviour⁴¹³.

including meth/amphetamine injectors and young IDUs. In the case of meth/amphetamine users, they are unlikely to regularly attend such services, and are more likely to obtain multiple needles at a given visit, reducing the window of opportunity for engagement. **It is important that harm reduction measures reach occasional, recent, experimental and young IDUs⁴⁰⁸. More active models of engagement with meth/amphetamine IDUs must be developed.**

Harm reduction strategies should be aimed at preventing the uptake of injecting *as well as* encouraging current injecting drug users who are unwilling or unable to stop to use non-injecting routes of administration. Recent evidence suggests that both injection *and* sharing of injecting equipment will **reduce** if there is greater access to smoking equipment for IDUs⁴⁰⁹.

The negative impact of outlawing smoking equipment upon this group – in terms of increasing risks of BBVI transmission – should be considered. **Provision of smoking equipment through NSPs should be considered as an additional harm reduction measure.**

The risks of smoking crystal methamphetamine need to be communicated to users in a balanced manner. The involvement of peers (users) in the design and delivery of messages is recommended.

Effective harm reduction measures that also include efforts to reduce sexual risk are needed, yet research into interventions targeted towards this hard-to-reach group was difficult to find. Investigation of **alternative methods of service delivery including a greater emphasis upon peer models of information and engagement**, and access through groups not explicitly drug-focused (e.g. gay, lesbian, bisexual and transgender (GLBT) outreach organisations for at-risk individuals in the GLBT community) might prove useful, and might allow for both sex and injecting harm reduction interventions⁴¹⁰. In countries where Internet access is high, **delivery of brief interventions and harm reduction information electronically** may provide some benefit to those unwilling to present to drug treatment services. Further work in this area could be of immense value.

5.3.3.2. *Sexual risk reduction*

High risk sexual behaviours are more common among meth/amphetamine users than other drug users and constitute a further potential route of HIV transmission: sexual risk should be reduced in this population. Interventions have been developed (largely in the United States)

to reduce sexual risk behaviours, with individual, community outreach, family and structural, and peer level approaches⁴¹¹.

The authors of a recent review concluded that there are many areas in which research is still needed, *particularly* in resource-poor settings and in comparing the relative impact of different levels of interventions⁴¹¹. Little research has been conducted with heterosexual meth/amphetamine users in low and middle income countries, and more research is needed in that context. Notwithstanding such gaps, **there is a clear public health imperative to introduce programmes to reduce sexual risk**, and several important components are indicated⁴¹¹. They are:

1. *Education*: accurate information about HIV transmission and how safer sex can reduce HIV transmission risk, with peers playing an important role in developing social norms.
2. *Condoms*: ready and discreet availability of condoms, publicly and free or at little cost.
3. *Voluntary HIV counselling and testing*: to increase knowledge of serostatus and facilitate safer sexual behaviour⁴¹¹.

5.3.4. Interventions to address HIV among IDUs

Interventions to address HIV among meth/amphetamine IDUs should be consistent with the UNAIDS *Comprehensive Package* for prevention and care of injecting drug users^{vii}.

Some of these have already been discussed above as they pertain specifically to meth/amphetamine users. The package includes:

- information, education and communication (IEC);
- full range of treatment options;
- implementation of harm reduction measures;
- voluntary confidential HIV counselling and testing;
- prevention of sexual transmission of HIV;
- access to primary health care;
- access to ARV therapy; and
- promotion, protection and respect for human rights – and particularly anti-stigma and discrimination measures.

^{vii} See e.g. http://data.unaids.org/UNA-docs/cco_idupolicy_en.pdf

5.3.4.1. HIV treatment

HAART should be available to those who need it¹⁴⁶ but in low and middle income countries access to such treatment is especially difficult. Discussions of treatment coverage are clearly beyond the scope of this review, but it bears remembering that access to effective treatment for HIV is not universally available for persons with HIV.

Poor adherence to HIV medication may be more common among those who have current drug use problems, and this includes meth/amphetamine dependence^{143 147 148}. **Persons presenting with meth/amphetamine dependence who are also HIV positive should be encouraged to address their drug use¹⁴³. Those actively using meth/amphetamine should be offered treatment for HIV; clinicians should offer treatment and provide good support to assist clients with adhering to medication¹⁴³.**

Part of good clinical practice involves assessment for potential non-adherence and this should be conducted carefully. Adherence counselling should be a component of treatment. This should be ongoing but evidence suggests that a particular focus should be placed upon maintaining adherence in the first four to six months of treatment, which has been found to be an important factor in improving the treatment outcome¹⁴³.

The evidence mentioned earlier regarding possible interactions between meth/amphetamine and ARV medication is cause for concern (see Section 3.4.4). Despite this, no studies have been carried out to investigate possible meth/amphetamine-ARV interactions. Research is needed to carefully investigate potential interactions, but in the meantime, WHO guidelines state that **current meth/amphetamine users should receive HAART but should *not* be prescribed ritonavir or lopinavir/ritonavir¹⁴³.**

5.4. Future research

There should be a concerted investment in research across all domains considered in this report – there is a clear, broad imperative for research upon the epidemiology and associated harms of meth/amphetamine use. This research should be conducted in varying countries and particularly focused upon low and middle income countries where little is known but use appears to be high. Research areas include but are not limited to (not in order of importance):

- Collection of routine data on the route, form, frequency and quantities of meth/amphetamine among users across countries.
- Studies of HCV and HIV risk among meth/amphetamine injectors.
- Better estimates of the population prevalence of dependence.
- Studies of the natural history of meth/amphetamine use and dependence.
- Careful research across countries and populations on the association of meth/amphetamine use with sexual risk behaviours.
- Studies of the motivations and functions of meth/amphetamine use across countries.
- Studies of the risks of meth/amphetamine induced psychosis and possible gene-environment interactions.
- Prospective studies examining the magnitude and nature of risks of HIV and HCV infection faced by meth/amphetamine users/injectors, across countries where the context of use and background prevalence of HCV and HIV differ.
- Studies of the impact of HAART on injecting risk behaviours among IDUs.
- Studies of possible meth/amphetamine-ARV interactions.
- Research into interventions to address meth/amphetamine dependence, including concerted efforts to develop effective and attractive pharmacotherapies.
- Research on methods of addressing sexual risk behaviours among heterosexual meth/amphetamine users in low and middle income countries.
- Examination of better models of service delivery for meth/amphetamine users – both harm and demand reduction services.
- In countries where Internet access is high, research into the use of the Internet to deliver brief interventions and harm reduction information.

6. Conclusions

Meth/amphetamine use is clearly associated with significant harm. Both use and problematic use appear to have increased in recent years. Despite this, good epidemiological data on the extent of the problem were disappointingly scarce. The data currently available are overly reliant on household or school surveys, which provide a poor indication of problematic use. Treatment data, although useful, are a lagging indicator and, given the poor engagement of meth/amphetamine users with treatment services, highly likely to underestimate treatment need. Research must be carried out *on an ongoing basis* with groups at risk of meth/amphetamine and other drug use problems, and must document both the form of meth/amphetamine used and the route of administration. On the basis of the current evidence, problematic meth/amphetamine use appears more prevalent in Asia, North America, a number of European countries, Mexico, New Zealand and Australia.

Both injecting and smoking pose particular risks for meth/amphetamine dependence; and there is evidence that those who begin smoking the drug may switch to injecting after some time. The evidence on injecting risk behaviours was inconsistent, with some studies finding an association with elevated risk, and others not. We could not find published data on the prevalence of HIV and HCV among meth/amphetamine users in most countries. Some studies found a lower prevalence than for other groups of drug injectors, but the evidence is far from conclusive.

Based on the existing data, sexual risk behaviours appear more common among this group, which poses risks for HIV and other STI transmission, and is especially important where sexual transmission is driving the HIV epidemic. Overly simplistic conceptions of the association between sexual risk and meth/amphetamine use are unhelpful. They are unlikely to produce useful responses, given the multiple factors likely to explain the association.

Better strategies for engaging with meth/amphetamine users are urgently needed, given that users are unlikely to engage with drug treatment and harm reduction services. HIV treatment should be provided to HIV positive users, with appropriate handling of risks for drug interactions. If we are to deliver effective interventions to persons experiencing problems relating to meth/amphetamine use, much more research into treatment is needed, particularly investigating proactive and attractive service models of consumer engagement.

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Appendix A: Method

This study comprised a desk-based literature review of peer reviewed and grey literature.

Searches of the electronic databases of Medline (via the OVID platform) and PubMed were conducted. Details of these searches are given below.

The following drug and alcohol databases and related online libraries were searched: The Australian National Drug and Alcohol Research Centre (NDARC) library; The Alcohol and other Drugs Council of Australia (ADCA); The CORK network catalogue; and the Asian Harm Reduction Network (AHRN). The bibliography “Key to methamphetamine-related literature” of the New York State Department of Health⁴¹² was consulted and Google searches were conducted on a country-by-country basis.

Material retrieved from these searches was deemed appropriate for inclusion in this review if it was an original research study, a commentary, a policy analysis, a review or report that described any of the following: the prevalence or incidence of meth/amphetamine use by injected and non-injected routes of administration; harms associated with meth/amphetamine use; HIV prevalence and risk behaviours of meth/amphetamine users; meth/amphetamine and HIV treatment and care; meth/amphetamine and production, trafficking and seizures of meth/amphetamine; treatment and policy addressing meth/amphetamine use or production.

In addition, UNODC and WHO country and regional offices were requested to provide any available and relevant material.

Additional literature cited within the retrieved material was also consulted.

As a general principle, more recent literature was preferred over older data. In all estimates of prevalence, the most recent data only were included in tables.

For some of the grey literature material retrieved data on sample sizes, methodology, and/or the organisation conducting the research could not be identified. If a country has no estimate, it means that either no data was available, or it did not investigate meth/amphetamine. For such countries, using other estimates from the region may be the only way to make an approximation of drug use in that country.

Medline search strategy

The following keywords and “MeSH” terms (in **bold**) were used in the searches of the literature for each region:

Injecting Drug Use

IDU OR IDUs OR “injecting drug” OR “intravenous drug” OR “intravenous substance” OR “injecting substance” OR **exp substance abuse, intravenous/**

Drugs and drug use

heroin OR cocaine OR amphetamine\$ OR methamphetamine\$ OR opioid\$ OR opium OR opiate OR drug abuse OR drug use\$ OR drug misuse OR drug dependen\$ OR substance abuse OR substance use\$ OR substance misuse OR substance dependen\$ OR addict\$ OR **exp designer drugs/ OR exp street drugs/ OR exp Cocaine/ OR exp crack cocaine/ OR exp amphetamines/ OR exp amphetamine/ OR exp methamphetamine/ OR exp Opium/ or exp Heroin/ OR exp substance-related disorders/ OR exp amphetamine-related disorders/ OR exp cocaine-related disorders/ OR exp opioid-related disorders/ OR exp heroin dependence/ OR exp morphine dependence/ OR exp psychoses, substance-induced/**

HIV/AIDS

OR HIV or AIDS OR HIV/AIDS OR “Human Immunodeficiency Virus” OR “Human Immune Deficiency Virus” OR “Acquired Immunodeficiency Syndrome” OR “Acquired Immune Deficiency Syndrome” OR **exp HIV/ OR exp HIV-1/ OR exp HIV-2/ OR exp HIV infections/ OR exp acquired immunodeficiency syndrome/ OR HIV seropositivity/ OR exp HIV seroprevalence/ OR exp AIDS serodiagnosis/**

Amphetamine Type Stimulants

ATS OR “amphetamine type stimulant\$” OR amphetamine\$ OR methamphetamine OR deoxyephedrine OR desoxyephedrine OR Desoxyn OR madrine OR metamfetamine OR methamphetamine hydrochloride OR methylamphetamine OR n-methylamphetamine OR d-amphetamine OR dextroamphetamine sulphate OR dexamphetamine OR dexedrine OR dextro-amphetamine sulphate OR dextroamphetamine sulphate OR d-amphetamine sulphate OR stimulant\$ OR **exp amphetamines/ OR exp amphetamine/ OR exp dextroamphetamine/ OR exp p-chloroamphetamine/ OR exp 2,5-dimethoxy-4-methylamphetamine/ OR exp p-hydroxyamphetamine/ OR exp iofetamine/ OR exp methamphetamine/ OR exp benzphetamine/ OR exp phentermine/ OR exp chlorphentermine/ OR exp mephentermine/ OR exp amphetamine-related disorders/**

PubMed Search Strategy

The following keywords and “MeSH” terms (in **bold**) were used in the searches of the literature for each region:

Injecting drug use

IDU OR IDUs OR “injecting drug” OR “intravenous drug” OR “intravenous substance” OR “substance abuse, intravenous” OR **“substance abuse, intravenous”** [MH]

Drug use

“Drug abuse” OR “drug use” OR “drug user” OR “drug users” OR “drug misuse” OR “drug dependence” OR “drug dependency” OR “drug dependent” OR “substance abuse” OR “substance use” OR “substance user” OR “substance users” OR “substance misuse” OR “substance dependence” OR “substance dependency” OR “substance dependent” OR addict OR addicts OR addiction OR “substance-related disorders” OR “amphetamine-related disorders” OR “cocaine-related disorders” OR “opioid-related disorders” OR “heroin dependence” OR “morphine dependence” OR **“substance-related disorders”** [MH] OR **“amphetamine-related disorders”** [MH] OR **“cocaine-related disorders”** [MH] OR **“opioid-related disorders”** [MH] OR **“heroin dependence”** [MH] OR **“morphine dependence”** [MH]

HIV/AIDS

HIV OR AIDS OR AIDS [sb] OR “HIV/AIDS” OR “Human Immunodeficiency Virus” OR “Acquired Immunodeficiency Syndrome” OR “HIV-1” OR “HIV-2” OR “HIV seropositivity” OR “HIV seroprevalence” OR “AIDS serodiagnosis” OR “HIV-1” [MH] OR “HIV-2” [MH] OR “HIV seropositivity” [MH] OR “HIV seroprevalence” [MH] OR “AIDS serodiagnosis” [MH]

Amphetamine type stimulants

ATS OR “amphetamine type stimulants” OR amphetamine OR amphetamine OR methamphetamine OR deoxyephedrine OR desoxyephedrine OR Desoxyn OR metamfetamine OR “methamphetamine hydrochloride” OR methylamphetamine OR “n-methylamphetamine” OR “d-amphetamine” OR “dextroamphetamine sulphate” OR dexamphetamine OR dexedrine OR “dextroamphetamine sulphate” OR “d-amphetamine sulphate” OR stimulant OR stimulants OR “P-chloroamphetamine” OR “2,5-dimethoxy-4-methylamphetamine” OR “P-hydroxyamphetamine” OR iofetamine OR methamphetamine OR benzphetamine OR phentermine OR chlorphentermine OR mephentermine OR “amphetamine-related disorders” OR **“P-chloroamphetamine”** [MH] OR **“2,5-dimethoxy-4-methylamphetamine”** [MH] OR **“P-hydroxyamphetamine”** [MH] OR **iofetamine** [MH] OR **methamphetamine** [MH] OR **benzphetamine** [MH] OR **phentermine** [MH] OR **chlorphentermine** [MH] OR **mephentermine** [MH] OR **“amphetamine-related disorders”** [MH]

Reference Group to the United Nations on
HIV and injecting drug use

www.idurefgroup.unsw.edu.au

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