

DRUG POLICY MODELLING PROJECT
MONOGRAPH 06

**A SYSTEMATIC REVIEW OF HARM
REDUCTION**

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Drug Policy Modelling Project Monograph Series

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THE DRUG POLICY MODELLING PROJECT

This monograph forms part of the Drug Policy Modelling Project (DPMP) Monograph Series.

Drugs are a major social problem and are inextricably linked to the major socio-economic issues of our time. Our current drug policies are inadequate and governments are not getting the best returns on their investment. There are a number of reasons why: there is a lack of evidence upon which to base policies; the evidence that does exist is not necessarily analysed and used in policy decision-making; we do not have adequate approaches or models to help policy-makers make good decisions about dealing with drug problems; and drug policy is a highly complicated and politicised arena.

The aim of the Drug Policy Modelling Project (DPMP) is to create valuable new drug policy insights, ideas and interventions that will allow Australia to respond with alacrity and success to illicit drug use. DPMP addresses drug policy using a comprehensive approach, that includes consideration of law enforcement, prevention, treatment and harm reduction. The dynamic interaction between policy options is an essential component in understanding best investment in drug policy. Stage One has: a) produced new insights into heroin use, harms, and the economics of drug markets; b) identified what we know about what works (through systematic reviews); c) identified valuable dynamic modelling approaches to underpin decision support tools; and d) mapped out the national policy-making process in a new way, as a prelude to gaining new understanding of policy-making processes and building highly effective research-policy interaction.

This monograph (No. 06) reports on the systematic review of harm reduction. Harm reduction was defined as policies and interventions that focus on reducing the harms associated with drug use, not the amount of drug used. The following interventions were reviewed: needle syringe programs; supervised injecting facilities; non-injecting routes of administration; outreach; HIV education and information and HIV testing and counselling; brief interventions (aimed at harm reduction); overdose prevention interventions and legal and regulatory frameworks. There is substantial evidentiary support for NSP – as an efficacious, effective and cost-effective intervention. There is also good evidentiary support for outreach. The other harm reduction interventions (supervised injecting facilities, non-injecting routes of administration, overdose prevention, and brief interventions) do not currently have a sufficiently large body of research knowledge to draw strong conclusions. There is little evidence for HIV education and information and HIV testing and counselling as behaviour change interventions.

Monographs in the series are:

01. What is Australia's "drug budget"? The policy mix of illicit drug-related government spending in Australia
02. Drug policy interventions: A comprehensive list and a review of classification schemes
03. Estimating the prevalence of problematic heroin use in Melbourne
04. Australian illicit drugs policy: Mapping structures and processes
05. Drug law enforcement: the evidence

06. A systematic review of harm reduction
07. School based drug prevention: A systematic review of the effectiveness on illicit drug use
08. A review of approaches to studying illicit drug markets
09. Heroin markets in Australia: Current understandings and future possibilities
10. Data sources on illicit drug use and harm in Australia
11. SimDrug: Exploring the complexity of heroin use in Melbourne
12. Popular culture and the prevention of illicit drug use: A pilot study of popular music and the acceptability of drugs
13. Scoping the potential uses of systems thinking in developing policy on illicit drugs

DPMP strives to generate new policies, new ways of making policy and new policy activity and evaluation. Ultimately our program of work aims to generate effective new illicit drug policy in Australia. I hope this Monograph contributes to Australian drug policy and that you find it informative and useful.

A handwritten signature in cursive script that reads "Alison Ritter".

Alison Ritter
Director, DPMP

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BACKGROUND

The Drug Policy Modelling Project (DPMP) uses a range of conceptual and analytic methods, including economic, systemic and complexity approaches, to develop new models to describe the dynamic relationships between law enforcement, treatment, harm reduction and prevention policy options in order to assess the optimal mix of these responses in particular situations.

The systematic reviews of law enforcement, prevention, treatment and harm reduction are geared towards producing data in order to feed into modelling the dynamic relationships and impacts between different drug policy responses. A number of different modelling approaches are being explored in this feasibility analysis, including stocks and flows (prevalence model); agent-based modelling (from complexity sciences); and systems thinking.

The aim of the Harm Reduction Systematic Review is to conduct a systematic review of harm reduction as part of the wider systematic review components of the DPMP. As with the other review projects (law enforcement, treatment, prevention) the harm reduction review will concentrate on establishing the effectiveness of harm reduction interventions. This in itself will be an important contribution to Australian drug policy resources. In addition, the data from the harm reduction systematic review will be used to input into the various models of drug policy responses.

The objectives of the harm reduction review are to:

- systematically identify studies in relation to harm reduction interventions
- describe and critically review these studies
- synthesise results of studies
- identify gaps in knowledge

The definition of harm reduction (and hence the scope of the review) has required considerable thought. The issues around definition of harm reduction are considered in section 3. The definition chosen for this review was programs or policies that aimed to reduce harm but not reduce drug use per se; and do not have as a primary mechanism of action, the reduction of drug use. By way of example, needle syringe programs (NSP) are included because the goal of NSP is to reduce the harm associated with injecting. Methadone maintenance has been excluded from the review because the primary mechanism by which it achieves reductions in harm is through reductions in use. With outreach, or brief interventions, the focus is on interventions that reduce the risk of harm associated with injecting (overdose, blood borne viruses [BBV]) rather than interventions for reduction of drug use itself.

This monograph starts with a description of the methodology employed for the review, followed by an overview section on harm reduction. This overview section also includes relevant literature on evaluation of harm reduction as a policy approach. Then the specific harm reduction interventions are reviewed: NSP, supervised injecting facilities, non-injecting routes of administration, outreach, education and information, brief interventions, overdose prevention interventions, and lastly legal and regulatory frameworks.

METHODOLOGY

We sought to firstly conduct a comprehensive search of all literature (published and unpublished) of relevance to harm reduction. The following resources were accessed:

a). Databases

The following electronic databases were searched using the strategy below: MEDLINE, EMBASE, PsycLIT, Cochrane, CINAHL, Science Citation Index, Social Work Abstracts, OVID, International Bibliography of the Social Sciences. In addition the reference lists of retrieved studies, reviews, and conference abstracts were hand searched.

b). 'Grey literature' particular utilising the Drug Policy Alliance Website formerly the Lindesmith as well as the Australian Drug Foundation Clearinghouse library and ADCA libraries.

c). Specialist libraries and existing reviews

The following reviews and library websites were searched:

<http://www.cochrane.org.au/>

<http://www.druginfo.adf.org.au/>

<http://www.lindesmith.org/homepage.cfm>

d). Websites on harm reduction / illicit drug use / BBVs

Websites in relation to harm reduction were searched.

Keywords

The key words used in the searches included:

harm reduction, heroin, illicit drug, drug use, dependence, abuse, substance, needle & syringe exchange / program, supervised injecting / medically sup injecting, naloxone, overdose, outreach (general), blood borne virus (general) and intervention, brief intervention, HIV, HIV testing, counselling, HCV.

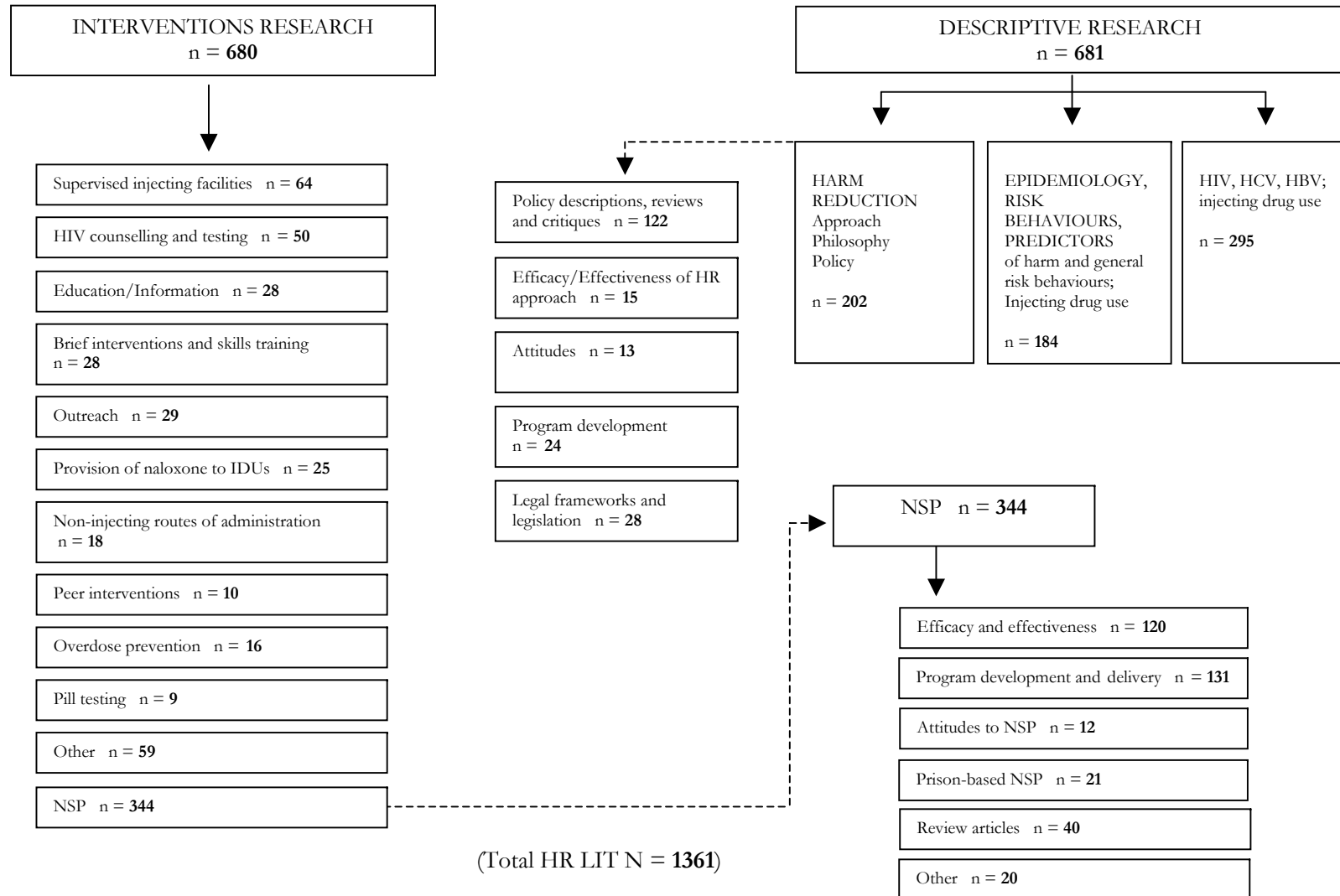
Criteria for considering studies for this review

As a result of the far-reaching searches that were conducted, more than 2,000 references were obtained. We then reviewed these references to eliminate those that did not cover injecting drug use, or illicit drug use (such as the literature on changing sexual risk behaviour in non-drug users); and the extensive HIV literature in relation to sexual transmission.

We then further sorted the remaining literature into those reports that covered an intervention, versus those that were epidemiological or descriptive in nature. We retained the epidemiological and descriptive literature to use for background research.

The resulting literature is charted in Figure 1.

Figure 1: Harm reduction literature



As can be seen from Figure 1, we identified a total of 1,361 research reports concerned with injecting drug use, harms and harm reduction interventions. Half of this literature (n=681) was descriptive in nature and covered the prevalence and incidence of HIV and other BBV, epidemiology of risk behaviours, predictors of harm and research that described harm reduction (approach, philosophy and policy).

The other half of the literature concerned harm reduction interventions (n=680). By far the largest intervention type to be reported on was NSP (n=344). This was followed by SIF literature (n=64) and an ‘other’ category (n=59). The other category included community-wide interventions; mass media campaigns; and generic descriptions of country-wide approaches, without specification of the actual intervention types.

Across the 680 harm reduction intervention studies, the research approaches and methods varied enormously. Much of the literature was descriptive rather than evaluative in nature. Whilst we used all the literature to prepare the review, we have concentrated upon those studies that provide evaluation, including pre-post observational designs and those with comparisons (or control) groups. As noted above, for inclusion in the harm reduction review, the goal of the study needed to be concerned with ‘reducing harm’ not reducing drug use per se. Interventions must have involved either heroin or unspecified IDU (injecting drug use).

The harm reduction interventions covered by this review are:

- Needle syringe programs (NSP)
- Outreach
- Education and Information (aimed at harm reduction not use reduction)
- Non-injecting routes of administration
- Brief interventions (aimed at harm reduction not use reduction)
- Overdose prevention interventions
- Legislation
- Other (tolerance zones, pill testing)

Excluded from this review are the following interventions sometimes included as harm reduction: methadone maintenance and other replacement therapies (buprenorphine, prescribed heroin, dexamphetamine), other forms of drug treatment (detoxification, residential rehabilitation); and diversion of offenders away from imprisonment and into treatment.

Methods of the review

Studies for possible inclusion were identified according to the search strategy described, and abstracts obtained. Two investigators independently evaluated each abstract or citation against inclusion /exclusion criteria. A coding system was developed in order to manage the large amount of literature. The literature was divided into the categories as seen in Figure 1. These emerged during the coding process, rather than a priori. Studies considered not applicable were checked and re-checked to ensure they were to be excluded.

AN OVERVIEW OF HARM REDUCTION

Definitions of harm reduction

Relatively speaking, harm reduction is a new paradigm in drugs¹. Whilst there had been reference to minimising harm in the alcohol and drug literature from the mid 1970's (Erickson, 1995), it only emerged as a significant paradigm in Australia in 1985. The first needle exchange programs were established in the UK (at Merseyside) in 1986 and in Amsterdam in 1984 (Riley & O'Hare, 2000). In 1990 the first International Conference on the Reduction of Drug Related Harm was held in Liverpool. With countries like Australia, Switzerland, the UK, the Netherlands and Canada as early adopters of the harm reduction approach, there is now a focus on spreading harm reduction policies and programs through Asia, Latin America and Central Eastern Europe. Most commentators agree that harm reduction has emerged in the context of widespread concern about blood borne viruses (for example Riley & O'Hare, 2000). To put it another way, the threat of HIV to the community was greater than the threat of injecting drug use – and harm reduction provides a concentrated focus on the harms of injecting, not on injecting per se.

What is perhaps surprising is the absence of a definition of harm minimisation or harm reduction. Indeed much of the early literature is concerned with definitional issues (see for example the 1995 Vol 15 (3) special issue of *Drug and Alcohol Review* devoted to definitional issues). "...debate has continued over the original, revised, catholic empirical and pragmatic definitions of harm minimisation" (Fitzgerald & Swards, 2002, p.17). The lack of a clear definition has meant that harm reduction is very inclusive and can readily accommodate a vast array of drug interventions. This may have been one of the strengths of the harm reduction approach (Single, 1995). Harm reduction encompasses all drugs – also perceived as one of the strengths of the approach (Hamilton & Rumbold, 2004). Harm reduction includes whole of population interventions as well as those targeted at individuals.

Despite this positive breadth of focus, the lack of definition to harm reduction means that it is hard to provide focus or boundary to the concept. Part of the difficulty in defining harm reduction is that it refers to both a philosophical approach and specific types of programs or interventions.

There does, however, appear to be some broad agreement that harm reduction refers to policies and programs that are *aimed at reducing the harms from drugs, but not drug use per se*. A useful distinction is drawn between 'use reduction' interventions and harm reduction interventions (for example MacCoun, 1998), emphasising the focus on reducing harms rather than use within the harm reduction approach.

The key features and principles of harm reduction include:

- that the primary goal is reducing harm rather than drug use per se;
- that it is built on evidence-based analysis (strategies need to demonstrate, on balance of probabilities, a net reduction in harm);
- that there is acceptance that drugs are a part of society and will never be eliminated;
- that harm reduction should provide a comprehensive public health framework;

¹ Some authors refer to the UK Rolleston Committee of the 1920's as the original reference to harm reduction. Methadone maintenance has been available since the 1950's in some countries.

- that priority is placed on immediate (and achievable) goals; and that
- pragmatism and humanistic values underpin harm reduction

(Hamilton & Rumbold, 2004; Heather, 1995; Hunt, 2003; Lenton & Single, 1998; Riley & O'Hare, 2000; Single, 1995).

Other terms used include harm minimisation, risk reduction, and risk minimisation (Riley & O'Hare, 2000). The preferred term in the DPMP is harm reduction, following the somewhat Australian convention of using harm minimisation to refer to the philosophical approach or general principles, and harm reduction to the specific interventions.

A strict definition has been used in this review (as above, interventions that reduce harms but do not aim to reduce drug use per se). Following this definition, some interventions described as harm reduction (such as methadone maintenance programs) are excluded from this review, because the primary mechanisms by which methadone maintenance reduces harm is through reducing drug use.

The issue of drug law reform comes up many times in the harm reduction literature (for example Erickson, 1995; Hunt, 2001; Riley, Sawka, Conley, Hewitt, Mitic, Poulin, Room, Single, & Topp, 1999; Uchtenhagen, 1995). Most commentators agree that harm reduction is not synonymous with drug law reform.

Associated with the definitional debates around harm reduction is also debate about the scope of harm reduction as a movement. Some individuals and groups believe harm reduction needs to be broadened out to be a more political movement (see the special issue of *International Journal of Drug Policy*, 2001 Vol 12(1)). There are different opinions about the extent to which harm reduction should be a left-wing movement concerned with human rights and drug user rights. Some commentators argue forcefully for harm reduction to lose its value-neutral stance and adopt a rights-based foundation, for example Hathaway (2001, 2002), and for a critique of this approach, see Keane (2003).

One of the important developments in harm reduction thinking has been to resolve the ways in which harm reduction can be evaluated and how different interventions may be constructed as harm reducing. Harm reduction forces the question: which policies and programs reduce the most harm? This has led to solid theoretical analysis of types of harms, and to whom they accrue, and this now forms an important conceptual backdrop to harm reduction and enables more explicit evaluation of interventions.

Harm is multi-dimensional, making harm reduction complicated to use as a simple decision-tool for policy – but it is in this complexity that we can ensure consideration of all possible strategies (not just those in one domain such as law enforcement or treatment), and where we can consider the impacts across a number of areas (such as health, or social).

This work started with Newcombe (1992) who identified three different levels of harms (to the individual, the community, and the society) and three different types of harms (health, social and economic). This two-dimensional approach allowed consideration of interventions in relation to their relative impact on both type of harm and to whom the harm accrued.

In further development of these conceptual models of harm, MacCoun and colleagues (for example MacCoun, 1998; MacCoun & Reuter, 2001; MacCoun, Reuter, & Schelling, 1996)

introduce the terms micro harm reduction and macro harm reduction. Part of the rationale for these terms arose from the desire to more clearly articulate a model of harm reduction and analyse the resistance to it in the US. But additionally, these conceptual models enable more detailed evaluation of specific policies in relation to the degree to which they reduce harm or increase harm (the iatrogenic effects of some policies).

In these models, total harm is assessed through prevalence, intensity and harmfulness, as demonstrated by the equation:

$$\text{Total harm} = \begin{matrix} \# \text{ of users} & \times & \text{average} \# \text{ of doses/users} & \times & \text{harmfulness per dose} \\ \text{(prevalence)} & & \text{(intensity)} & & \text{(harmfulness)} \end{matrix}$$

[macro harm] [micro harm = harm per unit consumed]

Thus, the goal of drug policies should be net harm reduction. By way of example, a policy that increases use (prevalence) but reduces the harm per use (harmfulness), may still be a net harm reducing strategy. A policy that significantly increases use, without reducing harms, will lead to a net increase in harm. Similarly, a policy that does not impact on use, but increases the intensity of use or the harmfulness of use is also a net harm increasing strategy. In this way, drug policies can be evaluated for the degree to which they impact on the number of users, the quantity of use per user, and the harmfulness per usage. [Overall prevalence of crack cocaine use has decreased in the US but because the intensity of use and harmfulness per use is so high for crack cocaine, the overall cost to society (one way of quantifying total harm) remains very high].

To enable the model to consider all types of harm, the bearer of the harm, and the source of the harm, a three-dimensional taxonomy has been developed (MacCoun & Reuter, 2001; MacCoun et al., 1996). Categories of harm are: health, social and economic functioning, safety and public order and criminal justice. Categories of bearers of the harm are: users, dealers, intimates, employers, neighbourhood and society. Finally the categories of source of harm are: use, illegal status and enforcement. With such an approach to categorising harm, it allows prioritisation of goals.

Benefit maximisation has also been raised within the harm reduction literature (for example Hamilton & Rumbold, 2004). If harm reduction is the balance of benefits against harms, then more serious consideration of benefits is required (Heather, 1995). The arguments around benefits of drug use also form part of the rights-based debates about the ideological stance of harm reduction (Hathaway, 2002; Keane, 2003).

Attitudes towards harm reduction

The acceptability of harm reduction interventions to existing alcohol and drug treatment providers is an important barometer of the degree to which implementation of these strategies in a co-ordinated and linked fashion is likely to succeed. The potential for 'clashes of culture' are high and harm reduction may challenge some drug treatment service providers (Denning, 2001). Another potential clash of cultures can occur between medical services for the treatment and management of HIV and harm reduction services (Heller, McCoy, & Cunningham, 2004).

There have been a handful of papers reporting attitudes towards harm reduction interventions. Ogborne & Birchmore-Timney (1998) studied the attitudes of Canadian treatment providers to harm reduction. The four areas explored included attitudes to NSP, heroin prescription, setting short-term treatment goals and methadone maintenance programs. They found the majority of

clinicians were supportive of short-term treatment goals, but the majority were not supportive of heroin prescription, with methadone maintenance support varying between 31% and 61%. The vast majority supported NSP. Those clinicians working in out-patient settings and those who did not subscribe to a disease model of addiction were more likely to be supportive of HR (Ogborne & Birchmore-Timney, 1998).

In Australia Bammer et al. (1996) found majority support among treatment providers for a trial of heroin prescribing. In the UK, more than half of treatment providers were in favour of needle exchange and harm reduction education (and alternative therapies, classified as harm reduction interventions in this study), whereas less than half were in favour of harm reduction strategies that provide a safe place to ingest drugs or after ingestion of drugs (Rosenberg, Melville, & McLean, 2004). Likewise, the majority of American treatment providers were in favour of needle exchange programs and harm reduction education (Rosenberg & Phillips, 2003).

Research has demonstrated that treatment provider attitudes can be shifted to be more favourable towards harm reduction (Goddard, 2003). The Harm Reduction Acceptability Scale (HRAS) was administered before and after a two-hour education session on harm reduction covering the philosophy and specific harm reduction interventions. There was a significant increase in scores after the education session (Goddard, 2003).

Aside from drug treatment service providers, pharmacists play a critical role in the provision of some harm reduction services, notably needle syringe programs and methadone maintenance programs. There is a literature in relation to the attitudes of pharmacists. Pharmacists who are involved in harm reduction service provision are more likely to have positive attitudes (Bonnet, Beauverie, Gaudoneix-Taieb, Poisson, Imbert, & Fournier, 2001; Matheson, Bond, & Mollison, 1999; Myers, Cockerill, Worthington, Millson, & Rankin, 1998). Overall pharmacists do appear to be supportive of harm reduction interventions, irrespective of their own service provision (for example Coffin, Linas, Factor, & Vlahov, 2000; Gleghorn, Gee, & Vlahov, 1998; Lewis, Koester, & Bush, 2002; Myers, Cockerill, Millson, Rankin, & Worthington, 1996; Myers et al., 1998).

Attitudes of injecting drug users appear to have been less frequently studied than attitudes of health professionals. Australian research on attitudes to supervised injecting rooms indicate positive support from injecting drug users (Fry, Fox, & Rumbold, 1999). London clubbers were very positive about harm reduction messages received as part of a London club campaign (Branigan & Wellings, 1999).

The attitudes of the general population to harm reduction appear to have been rarely studied. In Baltimore a household survey found 65% of the population in support of needle exchange (notwithstanding some concerns about attracting drug users to the area) (Keyl, Gruskin, Casano, Montag, Junge, & Vlahov, 1998). In Switzerland, the majority of the population have supported supervised injecting rooms and heroin prescription programs (Klingemann, 1996).

In Australia, the public are asked about their attitudes to drugs in the National Drug Household Survey (Australian Institute of Health and Welfare, 2005). Heroin was the 1st drug nominated as a problem drug in 2004 but this declined from 50.1% in 2001 to 39.4% in 2004. The number of people nominating cannabis as a problem drug increased from 23.7% in 2001 to 29.2% in 2004. There were also small increases in the number of people nominating methamphetamines, cocaine and ecstasy as well as the licit drugs alcohol and tobacco as problem drugs. Support for the legalisation of marijuana, heroin, methamphetamines and cocaine declined between 2001 and 2004. In 2001 29.1% supported the legalisation of cannabis compared to 27% in 2004. The

remaining dropped from around 7% in 2001 to 5% in 2004. A large proportion of households in 2004 supported an increase in penalties for the supply and sale of illicit drugs, however this was down by between 2-3% on the 2001 figures. 58.2% recommended increased penalties for marijuana whilst heroin, methamphetamines and cocaine showed between 83-86% of people supporting tougher laws (Australian Institute of Health and Welfare, 2005). The Australian public has not been surveyed about NSP.

Surveys conducted in the US between 1985 and 1991 in relation to public attitudes towards NSP revealed that about half of the population were in favour of the availability of needle cleaning kits, needle exchange and needle distribution (Normand, Vlahov, & Moses, 1995). However, in a comprehensive review of all national public opinion polls Burris, Strathdee & Vernick (2002) demonstrates that there is no clear consensus (support ranging from 29% to 73% for NSPs). Burris et al., (2002) also point out the importance of the wording of the questions and how this can alter the support levels.

Evaluation of harm reduction as a policy approach

Hunt (2003) identified four broad areas of criticism of harm reduction: that it does not work; that it keeps addicts stuck in continued drug use; that it has iatrogenic effects (it encourages drug use); and that it is a Trojan horse for drug law reform (Hunt, 2003).

The assessment of whether harm reduction is a useful and cost-effective policy largely resides in the evaluation of each of the individual programs, which is precisely the subject of this comprehensive review. The most strongly identified harm reduction program is needle syringe programs (NSP) and the body of evidence is very strongly weighted towards their effectiveness and cost-efficiency (Commonwealth Department of Health and Ageing, 2002; Gibson, Flynn, & Perales, 2001; Vlahov & Junge, 1998; WHO, 2004a).

In a theoretical analysis of the apparent iatrogenic effect of harm reduction (framed as ‘sending the wrong message’) MacCoun (1998) unpicks the arguments around this and demonstrates that there is no foundation upon which to base this negative perception of harm reduction. Hunt (2003) summarises the empirical evidence that demonstrates that harm reduction does not encourage drug use and this is dealt with in more detail in the NSP section below where the iatrogenic effects of NSP are fully explored.

There have been two well-cited reports of rapidly emerging epidemics in cases where NSP coverage has been good. Both come from Canada (Bruneau et al., 1997; Strathdee et al., 1997). Discussed in more detail in the NSP section of this review, they do highlight the complexity of evaluating the overall effectiveness of harm reduction policies and programs.

One intuitively appealing way of assessing the effectiveness of harm reduction is to examine and compare countries where harm reduction predominates as the policy platform with those countries where it does not. However, this exercise is fraught. Issues include the potential differences between actual programs versus the overall policy stance; a myriad of background factors (underlying prevalence, history of policies); cultural differences in implementation; and counting differences for key statistics and variables. Significant differences between countries in important variables also makes such analyses difficult if impossible to interpret. For example, the rate of cocaine use may be a major confound in country comparisons, given the significant association between cocaine use, frequency of injecting and HIV risk (Monterroso et al., 2000; Strathdee et al., 1997).

Despite these difficulties, there has been a desire by policy-makers and politicians to be able to compare countries in relation to drug-related use and harms. The UNODC has been developing a new Illicit Drug Index, and published the preliminary use of the index in the 2005 World Drug Report (UNODC, 2005). The Illicit Drug index “would provide a single, standard and comparable measure of a country’s overall drug problem, weighted by the size of its population” (UNODC World Drug Report, 2005, p. 166). The preliminary index has three components: illicit drug production; illicit drug trafficking; and abuse. Each of these three sub-indices is multiplied by a harm/risk factor for drugs. The work is still under development and not without controversy, due to formidable technical challenges and the potential to conflate measurement error. With further development, review and refinement, it may be a useful index to compare countries – and shed some light on issues such as harm reduction policy approaches.

In an ecological study comparing cities with and without NSPs on both HIV and HCV infection rates, those cities with NSP had a mean annual decrease of 18.6% in HIV seroprevalence, compared to a mean annual increase of 8.1% for those cities without NSP (Commonwealth Department of Health and Ageing, 2002). The results were less striking for HCV (because of the high underlying prevalence) but still revealed favourable results for NSP (60% HCV prevalence for cities with NSP compared to 75% for those without NSP (Commonwealth Department of Health and Ageing, 2002).

Wodak (1997) compared Australia with the USA in relation to HIV prevalence and concluded that Australia’s harm reduction policies and interventions are the most plausible explanation for the striking differences in HIV rates between the two countries (one in four infected in the US whereas less than 3 in 100 in Australia, figures taken from Fitzgerald & Searns, 2002). In a similar analysis Stimson (1995) finds that the UK’s harm reduction public health response has most probably averted an HIV epidemic. (See also Stimson, 1998).

Beyers, Toumbourou, Catalano, Arthur and Hawkins (2004) compare and contrast the US with Australia in relation to risk and protective factors for drug use. They concentrate on initiation and young people’s use of alcohol, tobacco and cannabis, and conclude that there is greater similarity than difference between the USA and Australia, but that the abstinence policy context is associated with higher levels of illicit drug use, whereas the harm reduction policy context associated with higher rates of legal drug use.

As Hunt (2003) suggests, in practice there may be little to distinguish those countries with harm reduction policy and those with zero-tolerance approaches. By way of example, he cites the availability of methadone maintenance treatment in the USA in a country that doesn’t support NSP; reminds us that drug prohibition is universal; and that countries with harm reduction approaches also have strong primary prevention initiatives to prevent the commencement of drug use in young people. (Hunt, 2003). Likewise Wodak comments that Australia may now have a ‘Tough on Drugs’ zero tolerance rhetoric, but continues to invest in harm reduction programs (Wodak, 2005).

Harm reduction programs are usually implemented as a package of reforms (as has occurred in Switzerland, Canada and Australia), so one harm reduction program alone cannot necessarily be used to demonstrate effectiveness. Teasing out the relative contributions is almost impossible. For example both NSP and treatment access showed risk reductions for HIV in multi-variate analysis (Monterosso et al., 2000). Other evaluations of harm reduction approaches note the need

to consider that there are multiple interventions and other factors occurring at the same time as the harm reduction (Strathdee et al., 1997; Uchtenhagen, 1995).

There have been publications evaluating harm reduction policies within countries (rather than comparing between countries). Whilst these studies do not directly test the effectiveness of the harm reduction policy approach, they do lend data to the problem.

In Australia, an early review by Hawks (1995) summarised the changes in drug use and harms over a ten year period in Australian history, from when harm minimisation was introduced as the national policy approach. They concluded that there is evidence for reductions in tobacco and alcohol consumption, reductions in risk behaviour amongst injecting drug users, low prevalence of HIV and low numbers of AIDS cases. They also noted many gaps in the evaluation literature (Hawks, 1995).

Reported decreases in needle sharing in Australia lend support to the argument (as quoted by Loxley, 2000) the rates were 1995 31%, 1996 28%, 1997 14% and 1998 18%. But some commentators have used the rising prevalence of HCV as indicators that harm reduction (and NSP more particularly) is failing. As both Loxley (2000) and Crofts, Aitken & Kaldor (1999) point out, the spread of any infectious disease needs to be understood in terms of background viral prevalence, viral infectiousness and the behaviour that spreads the disease. In the case of HCV, the first two variables are substantially different from HIV.

In a more qualitative approach to examining harm reduction as a policy, Fitzgerald (2002) identified a number of themes that characterise Australia's harm reduction policy: tolerance and diversity of views; the good sense of bureaucracy; independence; frank and fearless advice; checks and balances, and leading the community.

In Germany, Fischer (1995) assessed the impact of harm reduction through changes in drug use, activities of law enforcement personnel, criminal activities, and hospital presentations (drug-related incidents) – all of which were reduced in association with the new harm reduction programs (which included methadone maintenance). Somaini et al. (2000) reported an 80% reduction for HIV, HCV and HBV in injectors who had commenced injecting since the introduction of harm reduction measures in Switzerland. In the UK Stimson (1995) argued that harm reduction policies had resulted in reduced harms in the UK.

There are optimistic reports too, from New York, a city that experienced one of the largest HIV epidemics in the developed world. Des Jarlais et al. (2004) report a “substantial and consistent” decline in the HIV infection in those entering drug withdrawal in conjunction with increases in the use of HIV prevention services, particularly NSP and HIV testing and counselling.

A final approach to evaluating harm reduction as a policy (rather than the individual interventions themselves) comes from work modelling the impact of harm reduction on averted HIV cases and hence cost savings to the community. Kumaranayake et al. (2004) modelled the cost-effectiveness of a harm reduction program in Eastern Europe (Belarus) using simulations that estimated the number of HIV cases averted. The harm reduction program included information, education and communication materials, syringes and condom distribution, outreach fieldworkers and mass media campaigns. The researchers demonstrated high cost-effectiveness (Kumaranayake et al., 2004).

In another example of mathematical modelling to evaluate harm reduction, The National AIDS Demonstration Research (NADR) was built around community outreach efforts and included a variety of interventions such as brief behavioural interventions, supply of equipment (bleach, condoms) and peer networking. An analysis of the cost-effectiveness of the program (Pinkerton, Holtgrave, DiFranceisco, Semaan, Coyle, & Johnson-Masotti, 2000) demonstrated that the program was cost-saving overall (through averted HIV infections). [There have been a number of cost-effectiveness analyses of NSP, but these are covered in the NSP review below].

The ways in which evaluations may over or under-estimate the effectiveness of harm reduction interventions has been modelled by Pollack (2001a; Pollack, 2001b). Where the underlying prevalence of HIV exceeds 50%, the evaluations tend to overestimate their effectiveness. The reverse is true where underlying prevalence is less than 50% (a tendency to underestimate).

One problem for harm reduction has been the continued high prevalence and incidence of HCV, in spite of good coverage of harm reduction interventions (Crofts et al., 1999; Crofts, Nigro, Oman, Stevenson, & Sherman, 1997; Hagan et al., 1999). Typical of this work is the study by Patrick et al. (2001) examining HCV infections rates and seroconversion in Vancouver (with good NSP coverage). They report an incidence density rate of 29.1 per 100 person-years over the three years of the study, and conclude that the “harm reduction initiatives deployed in Vancouver during the study period proved insufficient to eliminate hepatitis C transmission in this population”. (HCV seroconversion was positively associated with being female, using cocaine, at least daily injecting and frequent attendance at the NSP, (Patrick et al., 2001). Pollack’s cost-effectiveness work (2001a) predicts that NSP will have little impact on the HCV incidence and prevalence rates (with cost-effectiveness between \$250,000 and \$1m per HCV case averted). In addition, UK injectors view HCV as unavoidable and ubiquitous, indicating low self-efficacy in endeavours to reduce risk (Rhodes, Davis & Judd, 2004). In Ireland, syringe borrowing remains high despite good harm reduction programs (Smyth, Barry & Keenan, 2001). And from Australia, HCV incidence has continued to increase, with a 45% increase between 1997 and 2001 (Law & Batey, 2003).

By way of contrast, researchers from the UK found lower HCV prevalence rates among injectors in England and Wales than in other industrialised countries, and argued that this supports the effectiveness of harm reduction approaches (Hope et al., 2001). In a like manner, Swiss researchers report an 80% risk reduction for those injectors who began injecting after the introduction of harm reduction programs in Switzerland (post 1991) compared to injectors who began injecting before 1988, but they do note continuing high incidence rates for HCV and HBV, even among new injectors (Somaini et al., 2000).

One problem arising from the research evaluating harm reduction effectiveness is the self-reporting of sharing behaviour. More than half of survey respondents reported sharing equipment in last month, and when asked in detail the rate rose to 78% (Hunter, Stimson, Judd, Jones & Hickman, 2000). Qualitative research explored notions of “I never share” and found that such statements are broadly true of actual behaviour, but that exceptions do occur. In this sense, rates of self-reported sharing behaviour are likely to be an underestimate (Rhodes et al., 2004).

There appears to be broad agreement in the literature that given the high underlying HCV rates, the high infectivity of the virus and the moderate changes in injector drug user’s injecting behaviour (such as sharing equipment), there are substantial challenges for harm reduction in tackling HCV.

Conclusions

Whilst there is not a formalised and internationally agreed definition of harm reduction, most commentators agree on the key features of harm reduction: a focus on harms rather than use; a pragmatic and achievable approach; an assumption that drugs are part of society; an underlying public health framework; and the use of an evidence-base to evaluate interventions in relation to their impact on net harm.

This review has taken a strict definition of harm reduction, and only included those policies and interventions aimed at reducing harm, and excluded those interventions that reduce use (and hence harm).

Research has demonstrated that attitudes towards harm reduction interventions are largely positive. Fears that harm reduction ‘sends the wrong message’ have no evidentiary basis.

Harm reduction describes both an overall policy approach, as well as a set of specific interventions. Evaluating the overall policy approach is complicated – country comparisons are difficult to conduct; there are many variables that may moderate the relationship between a country’s policy stance and policy implementation; and there are a large number of confounds. Research that has endeavoured to make country comparisons is cited above, but we are not convinced that this is useful approach because of the limitations noted. Harm reduction can be readily evaluated in relation to the efficacy and effectiveness of the individual interventions that comprise a harm reduction approach. We now turn to each harm reduction intervention in turn, starting with needle and syringe programs (NSP).

NEEDLE AND SYRINGE PROGRAMS (NSP)

Overview of NSP

The role of needle sharing in HIV and other infectious diseases is well documented – sharing remains the single most important risk factor for spread within IDU populations. The goal of NSP is to reduce the spread of infectious diseases (HIV, hepatitis), with secondary goals to: increase access to harm reduction support services and treatment services; provide information and advice about safer injecting drug use (and safer sexual practices); and make contact with hidden populations. Another way of expressing the goal of NSP is to decrease the circulation time of syringes, thereby reducing the potential for re-use and hence infection.

There is enormous diversity of NSP – diversity of service provision, models of operation and settings. Services provided within NSP differ between programs, with some focussed solely on the provision of clean injecting equipment (syringes, needles, water, swabs, bleach kits, disposal container, filters, and condoms). More comprehensive programs include education and information; referral to drug treatment services; referral to HIV counselling and testing services; medical care; social and welfare services and support. NSP programs also vary in the extent to which they are free or charge the injecting drug user for the equipment (or some components – for example in Australia all equipment is freely provided but users pay for sterile water). Programs also vary on the extent to which they also collect used equipment, and whether they operate as a strict exchange (1 for 1) or make equipment freely available and in unlimited quantities irrespective of the return of used syringes.

There are a number of different NSP models and approaches. These include: peer-based services; those run in association with treatment services; stand alone (primary outlets) or secondary outlets (in association with other health care); distribution via pharmacies (usually at a cost to the user); mobile services (foot patrol, van); vending machines; and special settings (eg prison programs). Coffin (2000) has reviewed the various modalities for syringe availability. Different models and venues for NSP attract different types of injecting drug users (Miller, Tyndall, Spittal, Li, Palepu, & Schechter, 2002; Moatti, Vlahov, Feroni, Perrin, & Obadia, 2001; Riley et al., 2000).

In a comprehensive description of US and Canadian NSP programs, Lurie 1993 (cited in Normand et al., 1995) classified programs according to their legal status; administrative body; funding source; type of site; staffing; on-site services; and on-site items provided. None of the characteristics were linked with measures of effectiveness (Normand et al., 1995). Australia programs are described in Commonwealth Department of Health and Ageing (2002).

Secondary NSPs are now being explored, especially in the US where there is limited access to primary NSP (secondary NSPs effectively operate via one peer attending the primary NSP for equipment, then distributing these amongst his/her own networks). For description and analysis see Latkin, Hua, Davey & Sherman (2003); Murphy, Kelley & Lune (2004); Sears, Guydish, Weltzien & Lum (2001); Snead et al., (2003); and Voytek, Sherman & Junge (2003).

The first Australian NSP started in Sydney in 1986 as a pilot program². The following year NSW adopted the program as policy and other states and territories followed soon after. The development of NSP in America is an interesting history of an unpopular, controversial and unwelcome public health measure – not the experience of other countries. As documented by

² According to some reports, an unofficial NSP started in 1984 in Sydney.

Lane and colleagues (2000) NSP started illegally and were promoted through civil disobedience. They largely emerged from street-based outreach efforts (that included provision of bleach as a legal intervention). Since then, NSPs in America have moved from adversarial relationships with government and officials to more co-operative relationships. Laws regarding needle exchange and availability have been changed; funding is now provided to services; and there is research and the growing institutionalisation of NSP (Lane et al., 2000).

Evaluation of NSP – some challenges

The evaluation of NSPs has used multiple methodologies. These include: simple pre and post NSP comparisons; comparisons of NSP attendees versus non-attendees (on variables such as BBV risk); longitudinal cohort studies; case control studies; regression of risk factors (seropositive versus seronegative); population prevalence and country comparisons; and dynamic epidemiological and mathematical modelling. The outcome variables used to assess the efficacy and effectiveness of NSPs have included: risk behaviour – sharing needles and unsafe sex; seroconversion rates for HIV, HCV, HBV; population prevalence of HIV, HCV and HBV; and access to treatment. Iatrogenic effects have also been studied.

Given the immense diversity of program types, and the diversity in research design approaches, it is difficult to effectively analyse the wealth of literature that exists on NSP. Some of the research challenges include the low underlying prevalence of HIV rates and high prevalence of HCV rates (depending upon the country) meaning that detection of change is difficult. There are also differences between studies that have recruited street-IDU or recruited from an NSP. Confounds such as access to syringes in the control groups; and the higher risk behaviour of NSP attendees also create complexities in the interpretation of the literature.

What is perhaps, therefore, surprising is that despite these many complexities and confounds, the literature is relatively unambiguous in providing positive evidence for the effectiveness of NSP, as summarised below.

Efficacy and effectiveness – narrative review

There is a wealth of literature examining NSP, as noted in Figure 1, a total of 344 articles were sourced, 120 of which concerned effectiveness and/or efficacy of NSP. Here, we concentrated upon those research reports that included comparison groups. Review papers are supplemented by individual research reports with a greater focus on those published since 2000. The outcomes from NSP are dealt with in turn: risk behaviour; HIV seroconversion; HCV seroconversion; and finally other outcomes (eg access to drug treatment).

Risk behaviour

Research that has tested self-reported changes in risk behaviour associated with NSP has mainly used pre and post designs and comparisons of attendees with non-attendees. Seminal publications in this area that demonstrated reduction in risk behaviour amongst NSP include Frischer and Elliott (1993); Keene, Stimson, Jones and Parry-Langdon (1993); Normand et al. (1995); Vlahov et al. (1997); and Watters, Estilo, Clark and Lorvick (1994). In a comprehensive review of the early literature, Gibson et al. (2001) identified 42 studies that examined the impact of NSP on risk behaviour (and HIV seroconversion, see next section). They conclude that there is substantial evidence that NSP are effective in reducing risk behaviour.

More recent research has also supported that conclusion. In a pre-post study, significant reductions in risk behaviour were noted at three month follow-up, but this study had a small 28% follow-up rate which limits the capacity to interpret the findings (Cox, Cassin, Lawless & Geoghegan, 2005). Other research that has compared NSP attendees with non-attendees has confirmed the findings of reduced risk behaviour associated with NSP (for example Bailey, Huo, Garfein & Ouellet 2003; Bluthenthal, Kral, Gee, Erringer & Edlin 2000; Gibson, Brand, Anderson, Kahn, Perales & Guydish 2002; Hagan & Thiede, 2000; Hutchinson, Taylor, Goldberg & Gruer 2000; Sears et al., 2001). There is little doubt now, that access to clean injecting equipment through NSP does reduce risk behaviour for blood borne viruses.

At the same time, many reports note continued high risk behaviour amongst NSP users, and rates of sharing at around or much greater than 20% of the NSP population (for example Hahn, Page-Shafer, Lum, Ochoa & Moss, 2001; Hope et al., 2002; Valenciano, Emmanuelli, & Lert, 2001; Wood et al., 2002). Interpretation of these continuing high rates of risk behaviour needs to accommodate environmental and background factors as suggested by Braine and colleagues, 2004. Braine et al. (2004) noted that risk factors for unsafe injection have increased over time, but unsafe injecting has remained stable.

There also continue to be coverage issues – both in terms of the extent to which any NSP can provide for all the injections that may occur in the drug using population and issues surrounding access. For example, poor utilisation of NSP has been noted amongst some sub-populations (Stevenson, Tannahill & Biggs, 2001).

In the first published meta-analysis Cross, Saunders and Bartelli (1998) located 10 research reports to be included in the NSP meta-analysis. The main outcome measure was sharing syringes (although a handful of studies could contribute to effect sizes for lending syringes, injecting drugs, use of bleach and condom use). The effect size for sharing was 0.394 (the overall weighted effect size for all NSP outcomes was 0.279, a positive effect, significantly different from zero).

Ksobiech (2003) has reported a more recent meta-analysis of NSP. Forty-seven studies were able to be included in the meta-analysis. The outcome was risk reduction behaviour, as measured by sharing, extended sharing, and lending or borrowing syringes. The effect sizes (reported as correlation coefficients) were, respectively -.189; -.161 and -.194, the negative sign indicating lower levels of risk behaviour associated with NSP (Ksobiech, 2003).

In the WHO review of NSP, (WHO, 2004a) 29 studies that assessed syringe sharing, borrowing or lending were located. Of these, 23 found results that supported the protective effects of NSP, 1 reported negative results and 5 studies showed no effect. The WHO report concludes that “these studies provide strong evidence to reject the null hypothesis that attendance at NSP does not confer protection against NSP” (WHO, 2004a p. 11).

Finally, in a modelling exercise using regression techniques, the USA drug use forecasting data, and controlling for drug price, underlying HIV prevalence rates, and behavioural trends (amongst other variables controlled for), DeSimone (2005) finds that NSP have a significant effect on reducing sharing behaviour.

HIV seroconversion

Seminal research demonstrating the efficacy of NSP in reducing HIV seroconversion includes Des Jarlais et al. (1996); Kaplan and Heimer (1992); and Vlahov and Junge (1998). The body of evidence regarding the protective effects of NSP against HIV continues to grow, for example

Monterroso et al. (2000) reported that not using used syringes was substantially protective against HIV acquisition. Given that we have now had NSPs for many years in some countries and cities, it is also possible to study the incidence declines in HIV associated with introduction of harm reduction measures in new cohorts since NSP (for example Goldberg, Burns, Taylor, Cameron, Hargreaves & Hutchinson, 2001).

In the WHO review of NSP, 11 studies that assessed seroconversion were located. Of these, 6 found results that supported the protective effects of NSP, 3 reported negative results and 2 studies showed no effect (WHO, 2004a).

Ecological studies, mathematical modelling and other simulation approaches have all been undertaken to assess the efficacy of NSP in reducing HIV prevalence and incidence. Vickerman and Watts (2002) developed a model demonstrating the number of HIV cases averted by NSP. MacDonald, Law, Kaldor, Hales and Dore (2003) compared 99 cities in relation to their HIV prevalence, and found that those cities with NSP had an overall decrease of 18.6% in HIV prevalence, whereas those cities without NSP had an overall increase of 8.1%. Finally in a Monte Carlo simulation of HIV spread, Raboud, Boily, Rajeswaran, O'Shaughnessy and Schechter (2003) demonstrated the significant positive effect of NSP in reducing HIV. This is compelling evidence for the efficacy of NSP in reducing HIV.

Not all the research on the impact of NSP on HIV infection rates has been positive. In spite of Vancouver's NSP program, an HIV epidemic broke out amongst IDU approximately five years after implementation (Strathdee et al., 1997). In Montreal Bruneau et al. (1997) reported higher rates of HIV in NSP attendees than in non-attendees. Monterroso et al.'s (2000) cohort study examining risk of acquiring HIV (seroconversion), found a positive effect associated with use of a NSP. Part of this can be explained by research design issues - in the Gibson et al. (2001) review, they noted that studies with mixed or negative findings were those which had research designs comparing NSP attendees with non-attendees. NSP attendees are at higher risk, and have greater injecting risk behaviour (Bruneau et al., 1997; Hahn, Vranizan, & Moss, 1997; Schechter et al., 1999) and more recently confirmed by: Bastos and Strathdee (2000); Hagan, McGough, Thiede, Hopkins, Weiss and Alexander (2000b); Marmor, Shore, Titus, Chen and Des Jarlais (2000). Importantly it may be precisely the attraction of high-risk injectors to NSPs that can result in the greatest potential for reduced HIV rates, as demonstrated in a Monte Carlo simulation (Raboud et al., 2003). Another important contribution of the Gibson et al. (2001) review is the examination of the effect of access to syringes in the control groups. In their review, all the studies with mixed or negative findings were conducted in settings which could not exclude the confound of access to syringes through pharmacies.

Nonetheless, risk behaviours continue amongst IDU irrespective of their use of NSP (for example Franken & Kaplan, 1997; Patrick et al., 1997) and as demonstrated by the Vancouver experience, NSP are likely to be only one amongst a number of harm reduction strategies that may be required to prevent HIV.

Hepatitis C

In one of the early research reports on HCV Hagan et al., (1995) conducted a case control study – HCV and HBV positive versus negative – and found that those who were HCV negative were more likely to have used the NSP, supporting its effectiveness in reducing risk of HCV and HBV. In an ecological study comparing cities with and without NSPs on HCV infection rates, those cities with NSP had a 60% HCV prevalence compared to 75% for those without NSP (Commonwealth Department of Health and Ageing, 2002)).

However, there continues to be evidence that NSPs are less effective in reducing HCV than in HIV, for example Mansson, Moestrup, Nordenfelt and Widell (2000) and Patrick et al. (2001). In Patrick et al.'s (2001) study in Vancouver, HCV incidence did not decline over a three year period, whereas HIV did. They concluded that in the context of the high transmissibility of HCV and frequent injecting (with cocaine) "the harm reduction initiatives deployed in Vancouver proved insufficient to eliminate hepatitis C transmission in this population" (Patrick et al., 2001).

Hagan et al. (1999) followed HCV and HBV negative participants for one year to examine seroconversion and its associated risk factors. There was no protective effect for the use of NSP in acquiring HBV or HCV.

In a modelling exercise to examine the impact of NSP on HCV, (Pollack, 2001a) assumed sharing occurred through random mixing, and an infectivity rate (varying between 0.005 and 0.05 at baseline) to model the spread of HCV contrasting short-term effects of an NSP with long-term effects. He finds that with model assumptions of 1/3rd reduction in incidence, the impact of an NSP on steady-state prevalence is minimal (it merely slows the spread). The model fits with the above research indicating much lower effect of NSP on HCV than on HIV.

Other outcomes

There have been a number of studies examining willingness to change drug use behaviour amongst NSP attendee's, all of which have shown that a reasonable portion of NSP users are interested and willing to change their drug use behaviour (Bluthenthal, Gogineni, Longshore & Stein, 2001; Henderson, Vlahov, Celentano & Strathdee, 2003; MacMaster & Vail, 2002). Successful entry into drug treatment after referral from NSP was demonstrated by Kuo (2003) with a 70% entry rate into treatment after referral. Hagan et al. (2000a) reported increased drug treatment entry among NSP users.

Cost-effectiveness evaluations of NSP

The cost-effectiveness of NSP has been calculated based upon estimates of the number of HIV and/or HCV infections averted by the program (program costs divided by averted infections). In one of the early analyses of cost-effectiveness, Normand et al. (1995) reported on three different models (simplified circulation model; the behaviour change model; and a combined model). The cost-effectiveness (per HIV infection averted) varied between \$3,773 and \$12,000 (USD), all far below the costs associated with lifetime treatment for a single HIV infection (Normand et al., 1995).

Lurie, Gorsky, Jones and Shomphe (1998) used the cost per syringe distributed (and used different costs based on different models of syringe distribution), assuming a 50% coverage of all injections for different cities. These costs were all found to be cost-neutral, compared to an annual seroincidence figure. All the syringe distribution strategies were likely to be cost-saving (Lurie et al., 1998).

Using mathematical modeling, Holtgrave, Pinkerton, Jones, Lurie and Vlahov (1998) estimated that 100% coverage of NSP for the US would cost \$423 million (USD) for 1 year. HIV cases averted through this were estimated to be 12,350, with an overall cost saving of \$34,278 (USD) per HIV case averted.

Laufer (2001) estimated a cost-effectiveness ratio of \$20,947 (USD) per HIV case averted, again a net cost-saving. Reid (2000) undertook a benefit-cost analysis, demonstrating net benefit (Reid, 2000).

In a comprehensive analysis of the return on investment for NSP in Australia, (Commonwealth Department of Health and Ageing, 2002), the researchers calculated the numbers of HIV and HCV cases averted, the expenditure on the NSP program, and treatment costs avoided. The results indicated a net saving of \$7,678 million accrued over the lifetime of cases averted (and net savings of \$391 million to the year 2000) (Commonwealth Department of Health and Ageing, 2002). They note that the cost-effectiveness for HCV is lower than for HIV cases averted.

In Pollack's (2001) analysis of cost-effectiveness of NSP for HCV prevention, he finds that NSP are not cost-effective for HCV (the cost per averted HCV case is much higher than the assumed medical costs associated with treating the HCV). This is largely because his dynamic epidemiological model does not produce substantial impacts on HCV.

The various cost-effectiveness and return on investment analyses for NSP have used different methods, and different assumptions. All include sensitivity analysis. The common finding is that NSP are a highly cost-effective intervention for HIV, resulting in net savings to government and the community. The results for HCV are less dramatic, but still produce predominantly positive cost-effectiveness ratio's in most analyses.

Other issues – public amenity and iatrogenic effects

One of the issues raised in relation to NSP is the concern that NSP increase drug use and injecting. The belief is that both existing drug users engage in more injecting and increased use; and that NSP lower the perceived risks of injecting resulting in greater numbers of new initiates to injecting.

In relation to the former (increases in drug use), the research evidence does not support this conclusion (Paone, Des Jarlais, Gangloff, Milliken & Friedman, 1995; van Ameijden & Coutinho, 2001; Vlahov & Junge, 1998). In a very nice RCT, Fisher, Fenaughty, Cagle and Wells (2003) compared free access to NSP with training in purchase of equipment from pharmacies in order to test the hypothesis that ready access to injecting equipment did not increase rates of injecting. Both independent (urine drug screens) and self-report measures of injection frequency demonstrated no significant differences between the groups, confirming the hypothesis that NSPs do not lead to increased rates of drug use.

There is some direct evidence to refute the argument that NSP increases the number of new initiates to injecting. Friedman et al. (1999) reported that awareness of the operation of an NSP was very limited in young people in the area (7%). Watters et al. (1994) found that over a six year period, the number of new initiates decreased. In summarising the evidence across a number of studies Normand et al. (1995) concluded that the presence of an NSP does not lead to increased new initiates to injecting.

The second area of concern regarding NSP has been in relation to public amenity, included concerns regarding discarded syringes, and increased public disorder in areas proximal to NSPs. Research evidence has accrued about both of these issues. In two studies Oliver, Friedman, Maynard, Magnuson and Des Jarlais (1992) and Fuller et al. (2002a) there was no increase in discarded syringes. In fact, it was more likely to be the reverse: a decline in discards associated

with NSP (Doherty, Junge, Rathouz, Garfein, Riley & Vlahov, 2000). And in a study of the impact of closure of an NSP, numbers of discarded syringes did not decrease after the closure (Broadhead, Van Hulst & Heckathorn, 1999). The risk of a needlestick injury from a publicly discarded syringe is very low. Thompson, Boughton and Dore (2003) could find no published cases.

There is no evidence of increases in crime rates in areas where NSPs operate (although the only research located was American so may not be generalisable given the US position on NSP). For example studies by Marx et al. (2000) and Galea, Ahern, Fuller, Freudenberg and Vlahov (2001) found no significant increase in crime rates.

A potential risk associated with NSP is the development of new social networks associated with NSP. In a single study on the issue, Junge, Valente, Latkin, Riley and Vlahov (2000) found that only 8% of NSP users had made a new social contact through the NSP.

In a comprehensive analysis of the successful arguments used by a community to close an NSP and analysis of the effects of this closure, Broadhead et al. (1999) concludes “ironically this... disproved many of the major claims asserted by the exchange’s opponents” (p. 62). Overall, research has demonstrated that there are few iatrogenic effects associated with NSP.

Conclusions

There is a substantial literature on NSP, including many descriptive reports of program development and operation. The research examining the efficacy and effectiveness of NSP has concentrated on three outcomes: reduced risk behaviour; reduced HIV seroconversion; and reduced HCV seroconversion. For the first two outcomes, the results are strongly positive. The evidence for the impact of NSP on HCV is positive, but the effect is less strong. Not only are NSP effective, they are also cost-effective, as demonstrated through a number of different, independent studies on the cost savings associated with NSP.

There are perhaps few other areas in illicit drug policy with such a strong evidence-base (if one excludes methadone maintenance) and yet there continues to be negative commentary around NSP and a desire to interpret single studies as evidence of ineffectiveness rather than using the full literature base. This stance appears to be driven from an ethical or moral position and is inconsistent with the evidence-base.

The WHO (2004a) review of NSP highlights some points not yet raised in our review. NSP have been successfully established in resource-poor and developing countries; NSPs demonstrate feasibility in relation to expansion and coverage; and there are unanticipated benefits to NSP (such as improved drug treatment access). Importantly, the WHO (2004a) review concludes that NSP on their own are insufficient to control HIV infection among injecting drug users. The evidence supports the integrated use of a number of harm reduction strategies to control BBV infection.

SUPERVISED INJECTING FACILITIES (SIF)

The development of supervised injecting facilities (SIF) was in response to public health concerns around an ever increasing, and more open drug scene resulting in drug users being a risk of overdose and blood borne viruses (Malkin, Elliott & McRae, 2003) and public order. SIF first appeared in Amsterdam in the 1970s and later were trialled in the Netherlands, Switzerland, Germany and Spain (Kimber, Dolan & Wodak, 2001). SIF was an extension to the harm reduction philosophy in places like Switzerland where a progressive approach to drug policy existed (Dolan & Wodak, 1996). The development of SIF in Australia did not occur until the 1990's when it was reported that illegal shooting galleries were in operation around Kings Cross, Sydney and there was a growing public health and public order issue (Kimber et al., 2001).

In this review the SIF literature has been broken down into the following sections:

- Definition
- Rationale for SIF
- Political context
- Attitudes to SIF
- Efficacy
- Conclusions

In total thirty-eight peer reviewed journal articles and thirteen reports were included as part of the final review using the search strategy previously mentioned.

Many of articles (n = 12) recovered were descriptive in nature, some of these included reviews but only in that they reviewed the development of SIF focusing on developmental issues and how the various SIF operated (Coffin, 1999; Dolan, Kimber, Fry, Fitzgerald, McDonald & Trautmann, 2000; Dolan & Wodak, 1996; Kimber, Dolan, van Beek, Hedrich & Zurhold, 2003a; Kimber et al., 2001; Skretting, 2002; van der Poel, Barendregt & van de Mheen, 2003).

A number of articles (n = 10) focused on the political development of SIF. Many of the countries that have developed SIF have done so as a result of dramatic shift in drug policy. Changes in European policy have led to the development of many different types and variations of a SIF usually as a result of increasing drug related deaths (mainly heroin related) and an increasingly visible drug scene (de Jong & Weber, 1999). In Canada similar concerns around public nuisance and an increase in drug related deaths led to changes in legislation allowing the first SIF to be trialled in Vancouver (Broadhead, Borch, van Hulst, Farrell, Villemez & Altice, 2003; Broadhead, Kerr, Grund & Altice, 2002; Kerr & Palepu, 2001). There are also two legal issues papers that considered the legal and ethical implications of SIF (Elliott, Malkin & Gold, 2002; Malkin et al., 2003).

Attitudinal studies (n = 10) were carried out with drug users in both Australia (Fry et al., 1999; Fry, 2002; Jordens & Higgs, ; van Beek & Gilmour, 2000) and Canada (Green, Hankins, Palmer, Boivin & Platt, 2004; Green, 2003; Kerr, Wood, Small, Palepu & Tyndall, 2003; Wood et al., 2003) with one other study being done in New York (Broadhead et al., 2003).

Broadhead et al. (2002) reported that there were no systematic evaluations on the operation and effectiveness of SIF but there is an ever increasing body of evidence as SIF were evaluated. This

literature comes from Sydney, Australia (Byrne, 2001; Kimber et al., 2003b; Mattick, 2001; Medically Supervised Injecting Centre, 2003; van Beek, 2003), Vancouver, Canada (Wood et al., 2004a, 2004b), Hamburg, Germany (Zurhold, Degkwitz, Verthein, & Haasen, 2003) and Barcelona, Spain (Anoro, Ilundain, & Santisteban, 2003).

Definitions and models

SIF have many definitions and many terms used to describe them including safe injecting centre, safe injecting room, drug consumption room or facilities, injecting room, fixing rooms and health rooms among others (Broadhead et al., 2002; Coffin, 1999; Dolan et al., 2000; Klein & Levey, 2003).

In 1999 Germany hosted a SIF conference that was attended by over 180 participants and while there were many permeations the participants agreed on the following as a definition of SIF:

[SIFs] are legal facilities that enable the consumption of pre-obtained drugs in an anxiety and stress free atmosphere, under hygienic conditions (Broadhead et al., 2002, p 333; Green et al., 2004).

A more formal definition might be a...

...legally sanctioned and supervised facilities designed to reduce the health and public order problems associated with illegal injection drug use...which enable the consumption of pre-obtained drugs in an anxiety and stress free atmosphere, under hygienic and low risk conditions (Dolan et al., 2000, p1; Kimber et al., 2001 , p1)

It is important to distinguish between supervised injecting centres and supervised injectable maintenance clinics (Strang & Fortson, 2004). Supervised injecting centres provide a safe place for drug users to use their own supplied drugs and respond to overdose, whilst perhaps providing access to basic health and welfare services. The latter is a treatment facility where methadone or heroin is prescribed as a treatment medication and the user ingests the medication on the premises.

A shooting gallery is not a SIF. Shooting galleries are space often rented by drug dealers where drug users pay a fee to use drugs on the premises (Klein & Levey, 2003). It often operates for-profit and does not usually provide other health and social services (Dolan et al., 2000; Wright & Tompkins, 2004). Shooting galleries are separate to the political climate and social context in which they operate (Ouellet, Jimenez, Johnson & Wiebek, 1991). In addition there is evidence that drug users in attendance at shooting galleries are more likely to share needles and other equipment and therefore be at greater risk of HIV infection (Klein & Levey, 2003).

There are a number of different SIF models that have been established. Typically SIF provide sterile equipment, a safe place to inject and information services. These may be described as single-function models. The multi-function models also include access to welfare services and have provisions for cleaning facilities such as a shower, laundry and even a meals service.

The drug consumption rooms of Europe generally conform to this more multi-function model of safe injecting plus basic health and welfare services. They provide for supervised injecting, provide clean equipment, overdose management, health care on site and referral to treatment services as well as on site facilities such as showers, laundry and meals (Dolan et al., 2000).

Another variant of the multi-function model is the inclusion of more medical services. This model, such as operates in Sydney, focuses on providing healthcare and other interventions and is staffed by a range of social and healthcare staff. In her report Kimber et al. (2001) found that social workers followed by nurses were the most frequently employed staff in all SIF when a review was completed of all SIF.

Wright & Tompkins (2004) argue the function of a medically supervised injecting centre should:

- Enable medical staff to oversee injecting in a clinical setting without providing direct assistance
- Have extended opening hours to accommodate drug users injecting three times a day
- Access to resuscitation equipment including naloxone
- Be one part of other services on offer such as needle exchange, safe injecting advice and overdose prevention
- Offer information on other treatment services
- Engage with local housing, business and police services

Rationale for SIF

An open drug scene where there is visible drug use and associated harms is often a catalyst to the development of a SIF - responding to public health as well as public order concerns (Kimber et al., 2003a; van Beek, 2003). SIF were developed as a public health measure in response to growing concern for the health of drug users in relation to BBV transmission, access to services, overdose and public order issues (Broadhead et al., 2003; Broadhead et al., 2002; Kerr & Palepu, 2001; Wood et al., 2001).

It is argued that SIF target issues that other services such as needle exchange & outreach are unable to grasp (Broadhead et al., 2002; Green et al., 2004; Kerr & Palepu, 2001). SIF are seen to allow health workers to engage with clients in a much more beneficial way (Broadhead et al., 2002; Kerr & Palepu, 2001).

Other studies such as Wood et al. (2001) have examined needle sharing practices and identified a number of risk factors that contribute to needle sharing such as difficulty accessing clean needles, needle sharing and reuse, injecting drugs in public, and injecting alone (a contributing cause of overdose) all of which are alleviated by use of SIF.

Most SIF have two aims (1) reduce health problems from drug use and (2) reduce public nuisance (Wolf, Linssen & de Graaf, 2003).

Political context

There has been much political debate around the development of SIF. The concerns that people have are similar to those concerns around harm reduction generally but simply put relate to concerns that SIF send the wrong message & condone drug use. There are also concerns about the impact of SIF on local communities attracting more drug related behaviours and therefore more crime (Bammer, 2000).

In Australia the decision to trial a SIF was made on the back of ever-increasing overdose death rate and media coverage over illegal shooting galleries in Kings Cross (Byrne, 2001; Wodak, Symonds & Richmond, 2003). Despite an unsuccessful legal challenge from the local community the Sydney SIF opened in May 2001 following recommendations from the Wood Royal Commission and the 1999 NSW Drug Summit (Kelly & Conigrave, 2002; van Beek, 2003; van Beek & Gilmour, 2000; Wodak et al., 2003).³

It has been reported that illicit drug use is the leading cause of death in the age range 30 – 49 in British Columbia, Canada (Kerr & Palepu, 2001). The combination of risk factors such as exposure to HIV as a result of public injecting and impact on public amenities have all led to the development of SIF in Canada (Kerr & Palepu, 2001). In 2002 Canadian authorities amended legislation to allow SIF and encouraged creative thinking into how this type of service may 'reduce social and health problems related to drug use' culminating in the opening of the facility in Vancouver, September 2003 (Kimber et al., 2003a). The SIF is situated in area of Vancouver known to be frequented by an estimated 5000 IDUs (Wood et al., 2004b).

In Switzerland unofficial consumption rooms were in operation as early as the 1980's. They operated covertly at that time as there was still stringent policies in place in regards to provision of services such as needle exchange and consumption rooms. Later as a result of the HIV epidemic among drug users policies changed which allowed consumption rooms to develop to include access to medical and health services (de Jong & Weber, 1999; Dolan & Wodak, 1996).

In Germany as a result of a very public and visible nuisance from outdoor drug use, policy change allowed for increased policing as well as the development of consumption rooms as part of a wider initiative that included needle exchange and methadone maintenance (de Jong & Weber, 1999).

Numerous other countries including in Austria & Denmark are paving the way for SIF development while France and Ireland are considering their options. A UK parliamentary committee recommended SIF however the Home Secretary deferred the idea citing the lack of scientific evaluations (Kimber et al., 2003a).

Politically, it is imperative that all agencies such as local government (planning and zoning), health services, (primary health and local health department) police and law enforcement officially sanction the development of SIF. This reassures the community about public health issues, while providing for the legal framework in which SIF can operate (Broadhead et al., 2002).

Attitudes to SIF

There have been a number of Australian studies that have examined the views of users in relation to SIF (Fry et al., 1999; Fry, 2002; van Beek & Gilmour, 2000). There is also some evidence that SIF will attract the high risk user who are perhaps the most vulnerable (Broadhead et al., 2003). The most important aspect for users in relation to SIF is in relation to having a space that is safe, private and accessible to them to use without the stress of worrying about police presence or being seen using in a public space. The risk of using in public exposes users for a number of reasons - they may not have access to clean equipment, they may feel rushed or under pressure to use quickly increasing risk of injecting unsafely causing a range of unnecessary health problems,

³ The history and politics of the Victorian SIF debate are not summarised here.

there is the threat of being assaulted or robbed and there is always the risk of overdose particularly if injecting alone. There is also the fear of police (Broadhead et al., 2002).

In attitudinal surveys conducted with drug users there have been extremely positive responses especially from public users (Broadhead et al., 2003; Fry, 2003; Fry et al., 1999; Fry, 2002; Green et al., 2004; Medically Supervised Injecting Centre, 2003; van Beek & Gilmour, 2000; Wood et al., 2003). Numbers as high as 71% (van Beek & Gilmour, 2000) and 79% (Fry et al., 1999) respectively have been found when groups of IDUs have been asked about preference to use a SIF at the time of their last injection. Green et al (2004) found public injectors with cocaine or heroin overdose experiences and who injected at least weekly were significantly more likely to use SIF. In terms of a willingness group (Fry et al., 1999) found that they were more likely to be male, have experience of non fatal overdose, and have used heroin more often in the past six months than those not willing to use a SIF. Broadhead et al. (2003) found that while IDUs who engaged in the highest level of risk behaviour would use SIF, they also found a high proportion of IDUs who said they would use SIF regardless of whether they injected publicly or not.

Other attitudinal studies have noted the use of SIF may be reduced if there are too many rules and restrictions, Kerr et al. (2003) examined attitudes of users to the Vancouver following changes in federal regulations and a visible police presence around the SIF. Not surprisingly 92% of those interviewed demonstrated a willingness to attend the SIF but this figure reduced to 31% at the mention of possible restrictions, which included:

- No drug sharing
- No assisted injecting
- Mandatory registration

In addition only 22% of those interviewed would still use a SIF if police were visible outside. This study also found that women would be less likely to use the SIF if the restrictions were in place leaving women at risk.

There has been little consultation with other minority groups however Jordens & Higgs (in press) found a 'high degree' of interest from Vietnamese IDUs towards SIF as they felt SIF could provide a safe place away from street injecting and the street drug market with all its associated harms – similar feelings about exposure to the street based injecting have been documented elsewhere (Fry et al., 1999).

Efficacy

In the literature it has been suggested that SIF will reduce overdose, public nuisance, transmission of BBV and encourage access to services. For the purpose of this review the outcome measures we are focusing on include overdose, public nuisance and access to service. There little evidence at this time in relation to impact on BBV transmission and crime (Dolan et al., 2000).

Unfortunately there is little hard data addressing the outcome measures listed above. As Bammer (2000) explained the 'gold standard' of evaluation randomised control trials are not easily applicable to this situation, thus the best evaluation for SIF would be to utilise before and after comparative data but this can be costly and difficult to manage politically if there has been little lead in time to the development of the SIF. Most effectiveness data derive from process

evaluations, where there is no comparator. Hence we are unable to conduct a meta-analysis of the efficacy of SIF.

In relation to overdose, the research generally reports the number of non-fatal overdoses managed successfully in the SIF. The underlying assumption is that had these overdoses occurred outside the SIF, some proportion may have led to severe sequelae.

Since opening none of the SIF have recorded a fatal overdose. In most of the SIF it is standard practice to administer oxygen in the event of overdose and then call an ambulance if the person could not be roused. Only a few SIF reported using naloxone on site (Dolan et al., 2000; Dolan & Wodak, 1996; Kimber et al., 2001). The six month Sydney evaluation report documented fifty heroin overdoses that were managed by use of oxygen with naloxone administered in eight cases (Mattick, 2001). The report concluded it was likely that the SIF had prevented a number of fatal overdoses had any of the 329 overdoses that occurred on site occurred in a public place (Medically Supervised Injecting Centre, 2003). More recently van Beek (2003) reported that 533 overdoses have been managed over the first two years at the Sydney site and that prior to registration at the Sydney site, 45% of clients reported a non-fatal overdose in the past 12 months with a median of three per client (van Beek, 2003).

The EVA program in Barcelona (Anoro et al., 2003) recorded from Jan 2001 – March that staff had assisted in 377 overdoses with 52% of these in respiratory arrest. Only a few of these required an ambulance to be called and onsite medical staff handled most incidents using naloxone.

Another line of evidence used to support SIF has been overall changes in overdose rates. Within cities where SIF are operating numbers of fatal overdoses have fallen dramatically for example in Frankfurt, Germany the number of fatal overdoses has reduced from 147 in 1991 to 22 in 1997 and there has been no recorded fatal overdose in SIF operating across Europe (Broadhead et al., 2002). However, one cannot attribute this reduction to SIF, or SIF alone.

Public nuisance is one of the most cited issues around SIF in the literature and by communities raising concerns. In response to an ever increasing visible and open drug scene the role of the SIF has been to provide a safe haven for drug users while reducing visible public use and the discarding of needles and syringes in public places (van Beek, 2003).

One of the outcomes of the Sydney trial was the reporting from local residents and business that since the SIF had opened there was less public injecting and fewer needles discarded in public places (Wright & Tompkins, 2004). Byrne (2001) reported mostly positive reactions from local businesses in response to the Sydney trial. Many of the European studies have reported similar outcomes (Dolan et al., 2000). Zurhold et al. (2003) reported that there was reduced public nuisance as measured by interviews with key informants such as local businesses, residents and the police.

All the above work has not included comparators and largely relied on key informant impressions. Wood et al. (2004b) following the open of the Vancouver SIF in September 2003 conducted a public order study, 6 weeks prior and 12 weeks following the SIF opening. Using five different measures of public disorder they examined public injecting, publicly discarded syringes, injection related litter, presence of drug dealers & number of police patrols. They found significant reductions in the number of episodes of public injecting, discarded syringes and other injection related litter ($p < 0.001$).

The opening of the safer injecting facility was independently associated with improvements in several measures of public order, including reduced public injection drug use and public syringe disposal (Wood et al., 2004b p. 731).

Referral to services is an important component of SIF. The Sydney evaluation reported at six months that 1 in 18 visits had resulted in a referral to other services. This included treatment for drug dependence (42%), referral to primary health care (25%) and referral to social welfare (25%) (Mattick, 2001). The final evaluation report found the SIF had made 1385 referrals to other agencies with similar percentage results (Burton, 2003; Medically Supervised Injecting Centre, 2003). In Frankfurt in 1997 of 194 clients who asked for a referral to detoxification via the SIF, 64 were successfully completed (Broadhead et al., 2002). Again, the problem with these data is that there is no comparator.

There is very little evidence that SIF has impacted on crime primarily because there is so little evidence either way. The final Sydney report could not conclude that the SIF had impacted on theft and robbery within the Kings Cross area but rather that changes in this particular crime data were more likely due to other factors such as the reduction in heroin availability (Medically Supervised Injecting Centre, 2003).

Positive feedback and behaviour change are the final cluster of outcome measures. In Europe it has been noted that contact with SIF has led to a 'general improvement in health and social functioning' of clients (Dolan et al., 2000, p 340). Wolf et al. (2003) reported that clients reported positive to changes in their behaviour as a result of attending SIF such as change to cleanliness and hygiene practice, less drug use in public and taking time to rest.

Zurhold et al. (2003) stated that in regard to encouraging behaviour change, they found that in their sample almost two thirds of drug users reported improved awareness of both risk and health since they attended the drug consumption rooms. Behaviour changes such as improved hygiene, less public injecting and taking time to prepare prior to using were all reported. Many clients also accessed other services.

In the Netherlands in 2000 the City of Rotterdam had six drug consumption rooms. The van der Poel (2003) study used a drug monitoring survey to review four of the six rooms. They found that drug users appreciated a safe quiet place to use drugs and 83% reported they had used drugs outdoors less often since having access to the drug consumption rooms. Drug users also self reported that visiting the rooms had allowed them to pay more attention to issues themselves and their health issues.

Conclusions

SIF have been credited with a number of public health and community benefits such as prevention of overdose, transmission of BBV, public order issues and access to other medical or treatment services (Green et al., 2004; Wood et al., 2004b). SIF form part of a wider harm reduction strategy designed to reduce drug related harm. There is only limited evaluation data on effectiveness. The most solid data are in relation to public nuisance, and discarded litter. Overdose deaths may be reduced by SIF but the order of magnitude may be smaller than claimed. It is not possible to attribute prevention of death directly to SIF. There is limited evidence for reductions in crime or reductions in BBV transmission. There is some evidence that

behaviour change occurs and SIF users access treatment, but without comparators to other interventions it is difficult to estimate the effect of the SIF.

One of the difficulties of estimating the value of SIF to harm reduction strategies is the fact that SIF only represent a small component of the wider public health initiatives (Hagan, 2002). In addition there are many confounding factors. The establishment of SIF are often preceded by a significant public injecting problem – and other interventions coincide. For example the policing response in Frankfurt and Zurich (of arresting foreigners and returning them home) would contribute to reductions in public injecting. Changes in the drug market, such as the Australian heroin drought, can coincide with SIF (as occurred in Sydney), confounding interpretation of the findings. Most importantly, however, the design of SIF evaluations need to carefully consider comparator data and endeavour to more carefully measure the direct effect of the SIF. The Canadian research work is very promising in this regard, and we hope new data on efficacy and effectiveness will emerge in the near future.

NON-INJECTING ROUTES OF ADMINISTRATION

Non-Injecting Routes of Administration (NIROA) as it is known in Australia or Route Transition Interventions (RTI's) as it is known in the UK is a harm reduction intervention that has the goal of reducing initiation into injecting and promoting transition away from injecting for those already injecting. There are substantial harms associated with injecting as a route of drug administration (for example see Dolan, Clement, Rouen, Rees, Shearer & Wodak, 2004; Hunt, Griffiths, Southwell, Stillwell & Strang, 1999). The harms include: infection with blood borne viruses, overdose, drug dependency (ie. the development of tolerance), and abscesses and other injection-related problems. Hunt (1999) noted that part of the rationale for developing NIROA interventions included the high rates of HCV in injecting populations that have been less responsive to NSP interventions.

Non-injecting routes of drug administration include ingestion (swallowing), sniffing, smoking, and inhalation of vapours. A route transition intervention has been defined as an intervention that:

- Attempts to prevent the transition to a more harmful route of drug administration such as injecting;
- Promotes the use of a safer route of drug administration (www.exchangesupplies.org).

The existing literature in this area includes research that has examined initiation into injecting (the factors and person characteristics associated with initiation); research that has examined the injecting drug use career, and spontaneous (or natural) changes in routes of administration; and research evaluating NIROA interventions.

Studying initiation into injecting enables identification of risk practices and better understanding of how education materials and other harm reduction services can be tailored to suit the circumstances of high-risk initiation to injecting. For example, publications by Carneiro, Fuller, Doherty, and Vlahov (1999); Crofts, Louie, Rosenthal and Jolley (1996); Varescon, Vidal-Treca, Gagniere, Christoforov and Boissonnas (2000); Vidal-Treca, Varescon-Pousson and Boissonnas (2002a); and Vidal-Treca et al. (2002b) enhance our understanding on initiation into injecting.

Spontaneous transition away from injecting does occur – suggesting that if we better understand how this occurs and why and in what population groups, we may be able to develop targeted interventions to encourage greater transition away from injecting. Bruneau, Brogly, Tyndall, Lamothe and Franco (2004) studied a group from the St Luc cohort who had a sustained period of non-injecting (defined as greater than 7 months). The characteristics of those who ceased injecting included being slightly older, including an older age of initiation to injecting, less frequent drug use, less time in prison and less criminal behaviour. The group of non-injectors were also less likely to use a NSP, and more likely to be HIV negative (Bruneau et al., 2004). In an age-matched case control study Fuller et al., (2002b) found that injectors were more likely to be non-African American, to have dropped out of high school, to engage in the sex industry and at an early age and be the victims of violence compared to non-injectors. Other work exploring transition to injecting includes qualitative research (Sherman, Smith, Laney & Strathdee, 2002) and study of regional differences in rates of injecting and injection-related behaviours (Gossop, 2000).

Understanding injecting behaviour is important in the design of appropriate interventions. Sherman et al. (2002) reported that for many injectors, the transition into injecting was originally

seen by them as a more effective and less costly way to ingest their drugs. “Unfortunately this method backfired, in that the amount of heroin consumed on a daily basis quickly escalated” (Sherman et al., 2002 p.118). In Spain, a survey of 900 heroin users explored initiation to injecting, transitions between routes of administration, and non-injectors behaviours (Bravo, Barrio, de la Fuente, Royuela, Domingo & Silva, 2003). The authors report the importance of the social environment, drug users’ beliefs about routes of administration and fears about health (including injecting itself, BBV and overdose) as important factors in the choice and/or transition to injecting. These various studies are cited as examples of the ways in which better understanding of drug user’s beliefs, behaviours and attitudes can be used to inform effective interventions targeted at NIROA.

Evidence of impact and effectiveness of NIROA

Research on NIROA interventions includes:

1. Interventions for existing injectors to decrease their own injection (transition to non-injecting)
2. Interventions for existing gatekeepers (injectors) initiating injecting for novices
3. Interventions for at-risk group of non-injectors being discouraged from starting injecting
4. Social marketing campaigns

The published research is limited.

The only reported research on interventions for reducing existing injectors’ injecting is work by Dolan et al. (2004). This Australian team developed a CBT-based intervention, which comprised 5 one-hour sessions held weekly. Three and six month follow-up interviews post intervention were conducted in this pilot study of n = 30. The average number of sessions completed was 2 (out of 5). At three months there was no significant difference on drug use, but a significant difference on HIV risk behaviour (with a 50% follow-up rate) (Dolan et al., 2004). At six months only 24% of the sample could be located, so the data are not able to be confidently interpreted. The decrease in frequency of injecting and decrease in sharing behaviour at three months suggests that the intervention may have achieved the desired outcomes, but in the absence of a no-treatment control group, interpretation of the data is difficult.

Of course, the major interventions to reduce injecting amongst existing injectors are the treatment programs, notable methadone maintenance. The research evidence in relation to the efficacy and effectiveness of treatment programs is not included here (needless to say, the evidence for reductions in injecting associated with opioid agonist pharmacotherapy maintenance is extremely strong).

Another avenue of work has been to explore interventions targeted at injectors to reduce their initiation of others (rather than their own injecting behaviour). The “Break the Cycle” campaign intervention aims to:

- Enable people to think about their attitude to initiating others
- Develop resistance to initiating others
- Increase awareness of actions that make it more likely that others will start; and
- Enhance people’s ability to manage initiation requests.

Coming from the UK, ‘Break the Cycle’ promotes three strategies: not talking about injecting in front of non-injectors; not injecting in front of non-injectors, and not giving someone their first

hit. Hunt, Derricott, Preston and Stillwell (2001) describe the ‘break the cycle’ campaign in detail. The overall goal is to reduce the number of people who begin injecting, and is based on evidence that current injectors are pivotal to other people’s decision to try injecting and that most injectors disapprove of initiating others into injecting. One of the advantages of the ‘Break the Cycle’ campaign, with its focus on existing injectors as ‘gatekeepers’ is that it avoids the ethical and practical complexities of working with non-injectors on the issue of injecting.

Hunt, Stillwell, Taylor and Griffiths (1998) evaluated the single session intervention. They report a three month reduction in injecting in front of non-injectors and a decrease in the number of requests to be initiated (n=86, 85% follow-up rate). Key findings included: injecting in front of non-injectors was almost halved; disapproval of initiating others was increased; there were fewer than half as many requests to initiate someone; and the number of people initiated by participants decreased (Hunt et al., 1998).

Hunt and colleagues have reported a process evaluation of a peer-delivered version of ‘Break the Cycle’ (Hunt, 2003, presentation at national conference on injecting behaviours, www.exchangesupplies.org/conferences/. Results taken from slideshow on the exchange supplies website (www.exchangesupplies.org/publications/Rtmanual/briefing.html, accessed 22/9/05). In this peer-delivered version, all NSP users were seen as potential ‘disseminators’ of the Break the Cycle message. For each ‘recipient’ in their social network who later presented back to the service and could successfully repeat the main campaign messages, disseminators were paid £5 (up to a maximum of 5 people - £25). Forty-nine disseminators were recruited with a subsequent 181 recipients of the Break the Cycle materials. The vast majority of recipients were positive about the program, reporting intentions to reduce risk behaviour and gaining new knowledge.

The third area of work has been to focus on at-risk non-injectors to prevent their transition to injecting (Casriel, Des Jarlais, Rodriguez, Friedman, Stepherson & Khuri, 1990; Des Jarlais, Casriel, Friedman & Rosenblum, 1992). In a randomised trial with non-injectors (heroin sniffers), a four-session intervention was delivered. With an 80% follow-up post intervention (at an average of 8 months) they found significant differences between the experimental and control groups. Of those who had received the intervention to reduce initiation to injecting, 16% had injected in the follow-up period, compared with 33% of the control group (Casriel et al., 1990; Des Jarlais et al., 1992). These results are positive, but the researchers noted that the number commencing injecting in the experimental group was still high and their clinical impression was that more intensive and extensive services will be required (Des Jarlais et al., 1992).

There is also emerging evidence that contact with treatment programs may prevent or delay transition to injecting for those who are not current injectors (Kelley & Chitwood, 2004).

Finally, social marketing campaigns (see Hunt et al., 1999) are a potential for reducing initiation into injecting and cessation of injecting. Campaigns have included the “chasing” campaign; “it only takes one prick to give you AIDS”; and “up yer bum” campaign. The campaigns are built around increasing cultural disapproval of injecting although (Hunt et al., 1999) cautions that they may lead to further marginalisation for injecting drug users. There have been no impact evaluations of these campaigns.

Hunt et al., (1999) also refers to ‘bridging approaches’ such as the opportunity to manipulate the way in which the illicit heroin market works. The illicit heroin market can be manipulated through the strategic use of law enforcement. In the example provided, police would concentrate

upon confiscation and seizure of those forms of heroin that are injectable (white, hydrochloride forms) and pay less attention to smoke-able forms of heroin (brown base).

Conclusions

There does seem to be some promise in NIROA interventions based on the limited research to date. More trials of interventions and evaluations of social marketing campaigns are certainly warranted. As a complement to this research, we also need to know more about the bioavailability and pharmacokinetics and pharmacodynamics of different routes of administration. In addition, research to examine whether there are harms associated with NIROA and the long-term effects of non-injecting routes is important.

OUTREACH AS A HARM REDUCTION INTERVENTION

Drug users are a marginalised and hard-to-reach population. Traditional health services do not necessarily cater well for, or appeal to, drug users. Because their behaviour is illegal, there is little incentive for drug users to present to health services. In addition, drug users often have itinerant or fluid lives, shifting with the nature of the drug market, changing patterns of drug use, and law enforcement pressures. For these reasons, outreach has become a popular mode of intervention with drug users. Outreach is well-designed to access hidden, marginalised populations. It has largely been used with homeless youth, although has now become one of the mainstays of harm reduction approaches to injecting drug use.

Outreach is really a term that describes the mode of delivery of an intervention, rather than a unique intervention in itself. In this sense, an HIV testing program, or a brief motivational intervention, or provision of clean injecting equipment (NSP) or education about safer injecting practices or NIROA could be delivered in an outreach mode (or in a non-outreach mode). For this reason, it is very difficult (and perhaps unhelpful) to try and isolate outreach as an intervention in itself. Nonetheless, the harm reduction literature does strongly identify outreach as one type of intervention to reduce harms from drug use.

Outreach is defined as contacting drug use in the communities where they live (WHO, 2004c). The most common interventions include provision of information about risk behaviour and behavioural strategies to reduce risk, provision of clean injecting equipment, access to BBV testing, and referral to relevant services (health services, welfare services and drug treatment services). The broader non-harm reduction literature also identifies other goals of outreach as: reducing the likelihood of further marginalisation, advocacy and casework (Petroulias, Bruun, Papadontas & Roy, 2005). There are a number of different models, variously referred to as detached, satellite, streetwork, self-help, network-oriented and peripatetic or mobile (Pead, Virins & Morton, 1999; WHO, 2004c). The network-oriented model concentrates on training peers who can then access at-risk networks of drug users (rather than just individual drug users). For further description of the types of programs and important elements of outreach, the reader is referred to Korf et al. (1999) and the WHO (2004c) report. The WHO (2004c) report also addresses issues in relation to the feasibility and sustainability of outreach in resource-constrained settings.

Outreach can be provided by peers (current drug users or former drug users), or by 'traditional' outreach workers (social workers or other health professionals). Research that has compared the effectiveness of peer-based outreach with 'traditional' outreach, supports the greater effectiveness of the peer-based models (Broadhead et al., 1998; Latkin, 1998).

Given the known efficacy of drug treatment in reducing drug use and associated harms, one of the critical aspects of outreach is its capacity to facilitate referral and access to drug treatment services. In a comprehensive research report, Appel, Ellison, Jansky and Oldak (2004) document the barriers to accessing drug treatment from a street outreach perspective, including views from outreach clients, outreach workers and drug treatment providers.

Evidence of effectiveness of outreach as a harm reduction strategy

In relation to the evidence supporting the efficacy and effectiveness of outreach, there are only observational pre-post studies (there have been no controlled trials of outreach). A comprehensive review was published in 1998 (Coyle, Needle & Normand, 1998) that summarised

the extant literature at that time (36 studies). Whilst acknowledging the limitations of the evaluation designs, the authors concluded that there is good evidence to support the effectiveness of outreach in relation to:

- Accessing a hard-to-reach population who would not otherwise receive services
- Cessation of drug use
- Reduction in injection frequency
- Reduction in needle sharing
- Increased access to drug treatment
- Increased risk reduction behaviour (safe sex and syringe cleaning)
(Coyle et al., 1998; WHO, 2004c)

Reductions in risk behaviour for those receiving outreach services was in the order of 27% on re-use of injection equipment (Coyle et al., 1998; WHO, 2004c).

More recent literature shows that further publications (more than 50 in the years 2000 to 2005) are largely concentrated on describing the service delivery associated with outreach; the use of outreach to access special populations and outreach services in relation to improving accessibility of HIV and BBV treatments and vaccinations. Sadly, there have been only a small number (n=2) of published experimental trials of outreach since the 1998 review. Latkin and colleagues (Latkin, Sherman & Knowlton, 2003) examined the efficacy of network-oriented peer outreach services, comparing an experimental intervention of small-group work which encouraged outreach, to an equal-attention control group. The experimental group were significantly more likely to report reductions in their risk behaviour at follow-up.

Wendell, Cohen, LeSage and Farley (2003) compared sites that received street outreach with comparison areas with no outreach services (the sites were not able to be formally matched, and as such there are a number of issues with the study design limiting generalisability of the results). Condom use was the outcome examined. The results indicated that there was a significantly greater likelihood of condom use in the intervention sites than in the comparison sites. The authors suggest that the effect appears largely due to direct contact with an outreach worker and supply of condoms, rather than through a more general community mobilisation effect around safer sex behaviours.

Latkin, Hua and Davey (2004) examined factors associated with outreach peer educators engaging with network members and discussing HIV prevention and providing injecting equipment. There appeared to be some differences in participant characteristics depending upon whether they engaged in discussions or provided equipment (for example current drug users were less likely to discuss HIV prevention but more likely to provide bleach).

There have been endeavours to quantify, in cost-benefit terms, the impact of outreach as a harm reduction intervention. Most of this work derives from mathematical modelling (and as such relies upon estimation of the effect or impact of outreach interventions in the first place). Wilson and Kahn (2003) model the best investment allocations between methadone maintenance and street outreach over the life of an HIV epidemic. They report that outreach is the best investment (in the epidemic stage of the cycle). They found a five-fold and ten-fold advantage for outreach over treatment where the outcome measure was HIV infections averted (Wilson & Kahn, 2003).

The National AIDS Demonstration Research (NADR) was built around community outreach efforts and included a variety of interventions such as brief behavioural interventions, supply of

equipment (bleach, condoms) and peer networking. An analysis of the cost-effectiveness of the program (Pinkerton et al., 2000) demonstrated that the program was cost-saving overall (through averted HIV infections).

Conclusions

There is evidentiary support that outreach enables access into hard-to-reach populations. Pre-post observational and quasi-experimental designs have shown reductions in risk behaviour associated with outreach programs. Modelling of cost-benefits has shown outreach to be a cost-effective intervention.

Boundaries defining outreach as a specific intervention for the purposes of modelling its impact and return on investment is almost as complex as defining its boundaries in the clinical world (see Strike, O'Grady, Myers, & Millson, 2004 for a review of the clinical boundary issues). It is apparent that 'outreach' is perhaps better thought of as a modality for interventions, rather than a specific intervention in itself. The effects of outreach may actually be attributable to the interventions provided within the outreach modality (such as needle exchange services). This has implications for the ways in which outreach may be represented in dynamic systems models.

HIV EDUCATION AND INFORMATION AND HIV TESTING AND COUNSELLING

One of the traditional HIV prevention interventions has been education and information. Again, it is difficult to isolate this intervention from outreach endeavours, provision of cleaning injecting equipment, and brief behavioural interventions. A good example of the dilemma is the National AIDS Demonstration Research (NADR), built upon community outreach across 29 sites in America, and labelled as “behavioural interventions”, the NADR work includes: HIV testing and counselling; provision of condoms and cleaning equipment for injecting; single-session educational programs; skills training in safe injecting and sex practices; counselling; cognitive skills training; and peer networking. Thus in evaluations of NADR sites it is almost impossible to partial out the effects of specific interventions from this long list⁴.

In spite of the significant overlaps between interventions, we have endeavoured to tease out at least some effectiveness data in relation to education and information and HIV testing and counselling as harm reduction interventions aimed at changing risk behaviour (the brief behavioural interventions follow in the next section). Education and information are traditional health promotion activities. In the context of harm reduction, education and information are provided in relation to increasing knowledge of risk behaviours. The goal is to provide accurate and credible information to promote behaviour that reduces risk. Typical coverage of education and information interventions includes risks of injecting and sharing practices and advice on how to reduce those risks. The education/information can be delivered through a variety of means: public awareness campaigns, targeted campaigns, peer networks and outreach services; through health services, and using posters, leaflets, video’s, booklets and so on.

There is a comprehensive literature in relation to HIV prevention amongst men who have sex with men, and other high risk groups, that focuses on high-risk sexual behaviour, rather than injecting behaviour (and the most common outcome measure is increase in the use of condoms) (for example, see Pinkerton, Johnson-Masotti, Holtgrave & Farnham, 2001). The cost-effectiveness of whole-of-population testing has also been recently established (Paltiel et al., 2005; Sanders et al., 2005).

Only research that involved injecting drug users is reviewed here. We have also chosen to concentrate on research that examines high risk injecting behaviour in IDU (rather than high risk sexual behaviour). (The interested reader is referred to Donoghoe, 1992; Kalichman, DiFonzo, Kyomugrsha, Simpson, Presser & Bjordstrom, 2001; Semaan et al., 2002). It is worth noting that sexual behaviour in IDUs appears much more resistant to change than injecting behaviours (Avants, Margolin, Usubiaga & Doebrick, 2004; Coyle et al., 1998; Cross et al., 1998) and that behaviour change in relation to HIV risk appears much harder to achieve in IDU populations than in non-IDU populations (hence the use of non-IDU research is likely to overestimate any effect).

Effectiveness of education and information

There are a number of research reports describing the outcomes associated with the standard NIDA HIV prevention intervention. (This a two-session information/education intervention. The first session consists of information and pre-test HIV counselling, lasting approximately 15

⁴ The NADR results are reported in the outreach section of this review, as most commentators label the intervention as predominantly outreach.

minutes. The second session reviews the information covering knowledge of HIV and sexual and drug-related risk behaviours; and provides the test results).

A number of studies have compared the standard intervention with enhanced brief interventions. The literature is difficult to interpret as a number of studies found the intuitively appealing result that the enhanced interventions were more effective than the standard educational interventions (for example Compton et al., 2000; Cottler et al., 1998; Sterk et al., 2003). However there are also a number of studies that do not find superior outcomes from enhanced interventions compared to the standard educational intervention (for example Colon, Robles, Freeman & Matos, 1993; Hershberger, Wood & Fisher, 2003).

The variables assessed as outcomes (reduction/cessation in drug use, entry into drug treatment, condom use, sharing injecting equipment, cleaning injecting equipment) may contribute to this, as some, such as condom use, rarely show any behaviour change, irrespective of intervention. Similarly, baseline risk levels contribute to the degree to which the interventions are differentially effective.

A meta-analysis on the effectiveness of educational programs (covering research published between 1984 and 1995) located 16 studies of educational interventions that met the inclusion criteria (experimental or quasi-experimental design, with sufficient statistical data to calculate an effect size, (Cross et al., 1998). The authors report an overall positive effective (weighted group mean = 0.749). More specifically, the meta-analysis revealed a positive effect of educational programs on: reducing injecting behaviour, bleach use, and sharing behaviour (with lower but still positive effect on condom use). The effects decayed over time (the longer the follow-up, the lower the effect). The greatest difficulty with interpretation of these positive results is that the educational interventions varied between studies and the majority were conducted within treatment settings (Cross et al., 1998).

Tucker and colleagues (2004) conducted a randomised trial comparing the provision of standard educational materials with a tailored single session behavioural intervention, aimed at reducing risk behaviour for HCV. At one month there were reductions in self-reported HCV risk behaviour in both groups, with no significant difference between groups. One interpretation of this research is that a brief behavioural intervention (in this case a session of 30 minutes) affords no greater improved outcomes than educational interventions. The authors note that both groups completed a detailed risk behaviour questionnaire, and suggest that this in itself produced sufficient change (Tucker et al., 2004).

There is also a literature on delivery of HIV education and information in the context of drug treatment programs (such as methadone maintenance, drug withdrawal and therapeutic communities). Clearly treatment recipients are a potential 'captive audience' for messages about risk reduction behaviours, although the clients are likely to be at low risk at the time of such educational interventions (due to their active participation in use reduction programs). Prendergast, Urada and Podus (2001) completed a comprehensive meta-analysis of HIV interventions within drug treatment programs. The majority of programs included in the meta-analysis covered didactic presentation of information, discussion, with some skills demonstration, and Prendergast et al., (2001) classified 61% of the programs as psycho-educational (although noting that the interventions were heterogenous). The results revealed an overall positive effect for harm reduction interventions in the context of drug treatment. Effects sizes were significant for changes in knowledge, attitudes and beliefs; sexual behaviour; and risk reduction skills (but not for injection practices).

Warner and Leukefeld (2001) examined the variables that predict both completion of HIV education interventions and success in reducing risk behaviour. One notable variable was the baseline risk behaviour – where baseline risk behaviour was high, there was more likely to be a successful intervention effect. Gender, educational level, and perceived risk of contracting HIV were all not significant variables in predicting risk reduction from the educational interventions.

Given equivocal findings for the effectiveness of education and information, more recent research has examined ways of attempting to enhance outcomes, or deliver the interventions via more effective means. The use of computer-delivered HIV education and information intervention may be a highly cost-effective method. Marsch and Bickel (2004) compared computer-delivered HIV education with one delivered by counsellors. The computer-delivered intervention resulted in more effective knowledge acquisition and knowledge retention at 3 months, but the groups did not differ on risk behaviour. The use of peers has been another mechanism by which the effectiveness of education has been enhanced. The potential potency of peers had been well-studied in the outreach interventions (see relevant section on outreach), and in research on injecting drug users' social networks. In a comparison of peer-driven outreach versus traditional outreach, Madray and van Hulst (2000) evaluated the effect of an educational intervention. They concluded that peer influences have more effect than education on risk reduction behaviours, and that “education does not play a significant role in the reduction of risk behaviour” (Madray & van Hulst, 2000, p. 209).

There is also an emerging literature on the use of educational intervention in the context of HIV antiretroviral treatment adherence (for example Martin et al., 2001; Rawlings et al., 2003). The results are not particularly positive.

There is concern about ‘message fatigue’ in relation to education and information interventions. One study looked at the relationship between message fatigue and risk behaviour (Tun, Celentano, Vlahov & Strathdee, 2003). They conclude “Among HIV-seropositive IDU, perceiving that HIV treatments reduce HIV transmission was significantly associated with unprotected sex. Risk reduction fatigue was strongly associated with unsafe sexual and injection behaviors among HIV-seronegative individuals. HIV prevention interventions must consider the unintended impact of HIV treatments on attitudes and risk behaviors among IDU” (Tun et al., 2003).

Lastly, social marketing campaigns have been popular tools to disseminate information. They provide information to either the general public or are more targeted at specific groups, such as injecting drug users. (Pulley, McAlister, Kay, & O'Reilly, 1996) describes the development and implementation of such communication campaigns for injecting drug use (there is also a literature on social marketing campaigns for legal drugs and other public health concerns, for example Atkin and Wallack (1990) and a Cochrane Review on effect of mass media interventions on health services utilisation (Grilli, Ramsay & Minozzi, 2005). Unfortunately, despite government investments in these strategies, there has been little by way of evaluation, in either the licit or illicit drugs area. In one example of published work in the illicit drug area, an information intervention to reduce risk behaviour and increase accurate knowledge included posters, leaflets and a ‘Vital Information Pack’ distributed through mass media (posters on the Underground and bus system) and targeted in London clubs themselves (Branigan & Wellings, 1999). The information campaign was positive in terms of its acceptability, appropriateness and usefulness (no impact evaluation was reported).

The evidence from non-injecting drug use areas of public health appears to hold some potential (although most mass media and social marketing campaigns in relation to changing alcohol use behaviour are not positive, (Babor et al., 2003). There are only a handful of process evaluations of these types of Education/Information approaches (which demonstrate high acceptability and changes on knowledge and attitudes), but effectiveness in relation to behaviour change (actual risk reduction) is not known.

Effectiveness of voluntary HIV testing and counselling

Voluntary HIV testing and counselling has been the subject of research (Weinhardt, Carey, Johnson & Bickham, 1999). The goals of HIV counselling and testing are to provide accurate information to the individual about his/her HIV status and to provide counselling to change any risk behaviour, or if already infected to avoid infecting others. A personalised risk assessment and the development of a risk reduction plan forms the foundation of the (very short – up to 30 mins post-test) counselling. One underlying assumption for HIV counselling and testing is that knowledge of one's own HIV status will produce behaviour change (see for example McCusker, Stoddard, Mayer, Zapka, Morrison & Saltzman, 1988; Varghese, Peterman & Holtgrave, 1999). It is unclear whether this is a valid assumption. Ompad, Fuller, Vlahov, Thomas and Strathdee (2002) compared behaviour change in injecting drug users who knew their HCV status versus those who did not know whether they were HCV positive or not. They found no changes in risk behaviour associated with knowledge of HCV status. A Cochrane review of the effectiveness of mass media campaigns to promote HIV counselling and testing concluded that there were short-term effects (in relation to increased testing) but no long-term effects were found (Vidanapathirana, Abramson, Forbes & Fairley, 2005).

There have been a number of negative or at least non-significant findings in relation to the impact of HIV testing and counselling on risk reduction behaviour. For example Calsyn, Saxon, Freeman and Whittaker (1992) found no positive effects for standard HIV testing and counselling. In an early review, Higgins (1991) concluded that there was little support for the impact of HIV testing and counselling in injecting drug users. A subsequent review confirmed that findings were mixed (Wolitski, MacGowan, Higgins & Jorgensen, 1997).

A meta-analysis concluded that HIV testing and counselling was effective in altering sexual risk practices amongst those who were already infected [secondary prevention], but not effective in altering sexual risk practices in those un-infected [primary prevention] (Weinhardt et al., 1999).

On the other hand again, there are some positive findings reported in the literature. For example from Amsterdam, voluntary HIV testing and counselling reportedly led to less borrowing and lending in Amsterdam (van Ameijden, van den Hoek & Coutinho, 1994). And in Australia, in relation to HCV testing, Aitken, Kerger and Crofts (2002) report positive outcomes from HCV testing in terms of risk reduction (although there are no control group data). In an unusual piece of research (examining Denmark, Norway and Sweden and comparing HIV testing and counselling with NSP) Amundsen, Eskild, Stigum, Smith and Aalen (2003) suggested that HIV counselling and testing might be more effective than NSP (Amundsen et al., 2003). Incidentally, this is not the only research report to compare educational interventions with NSP. In another such research report, Cross et al., (1998) found a smaller effect size for NSP than for educational interventions. These results do not accord well with the known high efficacy of NSP and the known equivocal efficacy for educational interventions in reducing HIV risk behaviour so it is unclear how to interpret them. The importance of effective referral as part of an HIV testing and

counselling intervention has been reinforced by Marx, Hirozawa, Chu, Bolan and Katz (1999) and Booth, Crowley and Zhang (1996).

Conclusions

Education and information are intuitively appealing harm reduction interventions. They are likely to be among the less costly interventions, and assume that individuals are rational actors, who make behavioural choices that reduce harm in the context of full information. Unfortunately, the research evidence does not support the effectiveness of education and information as a primary harm reduction strategy. Whilst studies (as cited above) have found some positive effects, the effects are moderate and in some cases not significant. Similarly, HIV counselling and testing is an important part of an overall harm reduction strategy, but in and of itself, is unlikely to result in major behaviour change.

The Academy for Educational Development's (2000) comprehensive approach to HIV prevention for IDUs includes the group of HIV counselling and testing, partner counselling and referral and prevention case management as one of eight essential elements in a comprehensive approach to HIV prevention (Academy for Educational Development, 2000). Certainly there is an important role for the provision of voluntary HIV and hepatitis testing and associated counselling for the purposes of screening and early access to treatments. Whether such services actually reduce risk behaviour seems equivocal.

There has been an interesting aside in conducting this review. The research literature in relation to HIV counselling and testing; and education strategies appears to be somewhat divorced from the more usual harm reduction literature. Reviews of harm reduction approaches tend not to include the body of knowledge in relation to these types of interventions. Partly this seems to arise because the education, information and testing research is done by different groups of researchers, and is largely concentrated in the USA, whereas much harm reduction writing comes from Europe and Australia.

We now move to examine brief interventions, over and above education and information and testing. Brief interventions are defined here as including some form of skills training (ie. more active than passive information provision). And consistent with the harm reduction focus of this review, brief interventions that are concerned with reducing harm, but not those concerned with reducing drug use, are covered.

BRIEF INTERVENTIONS

Brief interventions, in the context of this harm reduction review, are those interventions that are aimed at changing risk behaviour (including risk for blood borne viruses, risk for overdose and risk for other harms associated with injecting drug use) without focussing on use reduction. They include motivational interviewing, brief solution focussed therapy, single session therapy, cognitive-behavioural therapy; and are all delivered in a short duration of time. The length of a brief intervention can vary between a single 15 minute intervention to a four session intervention delivered over a number of weeks. The maximum length of four sessions is somewhat arbitrary (and indeed there is literature describing brief interventions that occur over 12 sessions! Hardly brief in my view).

There is an extensive literature in relation to the efficacy of brief interventions for the reduction of drug use, which will not be summarised here as it focuses on use reduction (the interested reader is referred to Baker, Boggs, & Lewin, 2001; Moyer, Finney, Swearingen, & Vergun, 2002; Saunders, Wilkinson, & Phillips, 1995) and the challenges associated with moving from efficacy to effectiveness in this area, Roche & Freeman, 2004). Overall there is good evidentiary support for the efficacy of brief interventions for drug use changes (for example Noonan & Moyers, 1997) for motivational interviewing.

Brief interventions - efficacy and effectiveness

Given the wealth of literature in relation to brief interventions and use reduction, it was expected that there would be a reasonable literature on brief interventions for risk reduction. This is not the case. Only a handful of studies could be located that examined brief interventions to reduce harms associated with injecting drug use. The motivational interviewing literature will be examined first, followed by more generic brief interventions.

In a systematic review Dunn, Deroo and Rivara (2001) reviewed motivational interviewing as a brief intervention to impact upon HIV risk behaviour (they also covered three other domains: substance abuse, smoking and diet/exercise). They located four studies in HIV risk reduction that met the inclusion criteria for the systematic review. Two of the four studies had significant positive effects, although both of these measured sexual risk behaviour as the outcome. (The two studies measuring changes in injecting risk behaviour (Baker, Heather, Wodak, Dixon & Holt, 1993; Baker, Kochan, Dixon, Heather & Wodak, 1994) did not produce significant effects). Based on this review, the evidence does not support the efficacy of motivational interviewing in the context of injecting behaviour as HIV risk (Dunn et al., 2001).

In a subsequent meta-analysis Burke, Arkowitz and Menchola (2003) also looked at the efficacy of motivational interviewing for impacting on HIV risk behaviour, and found a non-significant effect size. No new literature was included (the two Baker et al studies were the only inclusions), but it is interesting to note that the meta-analysis confirmed the efficacy of motivational interviewing in changing drug use behaviour (most particularly alcohol) which suggests that further research with motivational interviewing approaches and risk behaviour is warranted.

Since 2003, there have been two new research reports examining motivational interviewing as a risk reduction intervention. Stein, Anderson, Charuvastra, Maksad and Friedmann (2002) (not included in the Burke et al., meta-analysis) recruited NSP participants assessed as problem drinking and randomised them to two groups: a two-session motivational interviewing

intervention; and a no-intervention control. The measure of interest was injecting risk behaviour. At six-month follow-up (with 96% follow-up rate) both groups demonstrated reduced risk behaviour, although some statistical analyses showed a greater effect for the motivational interviewing group. McCambridge and Strang (2004) examined the effectiveness of single session motivational interviewing with young people currently using illicit drugs. They reported significant effect sizes for the experimental group in relation to reductions in tobacco, alcohol and cannabis use. Although positive, the study excluded any current heroin users or injectors, and largely focussed on use reduction outcomes.

Moving to HIV prevention brief interventions, the Centres for Disease Control have produced a compendium that summarises effective HIV prevention interventions (Centres for Disease Control and Prevention, 2001). From 276 studies, only 24 met the criteria for rigorousness (controlled trials, with relevant behavioural or health outcomes). And of these 24 studies, only 5 addressed IDU behaviours. Three of these evaluated a small group intervention that averaged 4 sessions (each study varied in terms of the target population). The sessions covered knowledge of BBV, safe injecting practices and safe sexual practices, and access to treatment. The interventions reduced risk behaviour. (El-Bassel & Schilling, 1992; Magura, Kang & Shaipro, 1994; McCusker et al., 1992 all cited in Centres for Disease Control and Prevention, 2001).

As discussed in the earlier section on education and information interventions, there is a literature comparing educational interventions (usually the standard NIDA HIV prevention intervention) to enhanced brief interventions. In the main, the enhanced interventions do not demonstrate vast superiority across outcome variables. For example, Colon et al., (1993) evaluated a three-session educational program in a randomised design and found no significant differences over and above the standard intervention (multi-element community outreach program). Another example where an enhanced brief intervention did not appear superior to standard educational intervention is that reported by Tucker et al. (2004) (see above section for description). The evidence did not support the provision of education/information over and above other interventions.

Sterk, Theall, Elifson and Kidder (2003) compared the standard NIDA HIV prevention intervention (see above section for description) with two enhanced conditions: each enhanced condition was four sessions, with one including a focus on motivation, and developing and reviewing short-term and long-term behaviour change goals. The second enhanced condition focussed on negotiation skills, developing tailored negotiation and conflict resolution skills. All participants were female African-American HIV negative injecting drug users. When pooled all three interventions produced significant change at six months. Despite insufficient statistical power to directly compare the three groups, the authors conduct posthoc analyses that suggest that there were significant improvements for the two enhanced conditions compared to the standard condition. The findings suggest that culturally appropriate and gender sensitive enhanced interventions may afford the best results in relation to risk reduction.

In the majority of studies, including those cited above, both experimental and control groups improved across the interventions. Gibson, McCusker and Chesney (1998) suggest that the participation in an evaluation or trial itself has significant effect, and the impact of health risk assessments alone may account for the results of some trials.

As with educational interventions, there is a literature in relation to brief interventions in the context of drug treatment. The goal is to increase risk reduction behaviours through brief interventions whilst the drug user is participating in drug treatment. Examples of this work are Sorensen et al. (1994) and McMahan, Malow, Jennings and Gomez (2001) both of which

conclude that the brief intervention showed little additional effect on risk behaviour (Sorensen found some change in knowledge).

Applying harm reduction interventions to existing methadone maintenance clients has been studied by Avants and colleagues (Avants et al., 2004) who compared a single-session risk reduction intervention plus standard care with a 12-session group harm reduction intervention. The intervention was based on the Information-Motivation-Behavioural skills model for reducing HIV risk behaviour (Avants et al., 2004). They found no significant differences between the two groups on rates of heroin use during the 12 week program and no significant differences on reported needle sharing. There were significant differences in favour of the harm reduction group on behavioural skills and knowledge of HIV. (The sexual risk behaviour results favoured the harm reduction group). (Avants et al., 2004).

The impact of psychiatric co-morbidity on the effectiveness of brief interventions has been studied. Compton, et al. (2000) report on the impact of anti-social personality disorder and depression on outcomes from the standard NIDA HIV educational intervention and an enhanced peer-led HIV prevention intervention. There were no differential outcomes between the two interventions based on psychiatric co-morbidity – both diagnostic groups responded positively to the interventions, although they observed trends for greater improvements in the depressed group, and less improvement in the anti-social personality disorder group (Compton et al., 2000).

Conclusions

The efficacy and effectiveness of motivational interviewing and other brief intervention approaches in the context of alcohol and drug use has been well-established. The research on the application of these techniques to the area of harm reduction (whether it be through specific HIV risk reduction programs, or more general harm reduction interventions) is disappointingly small. Only a handful of studies could be located, but most of these demonstrated positive effects. Motivational interviewing is worth further research endeavour. The work on brief interventions for HIV prevention largely demonstrates that more intensive interventions are equally effective compared to shorter interventions. Two authors have commented that the effect of a comprehensive risk assessment in and of itself is likely to produce behaviour change (as demonstrated in the control groups for studies). Development and further efficacy and effectiveness research on a single-session brief intervention that makes use of comprehensive risk assessment and feedback processes may prove very beneficial.

OVERDOSE PREVENTION INTERVENTIONS

This review has concentrated upon interventions concerned with reducing the risk of blood borne viruses. Another significant harm arising from injecting drug use is overdose. Overdose prevention interventions are concerned with reducing the risk of an overdose and improving the likelihood of a positive medical response to an overdose. These are harm reduction strategies because they do not aim to reduce drug use per se, but reduce the likelihood of an overdose and the harms arising from them.

There is a vast literature examining heroin overdose, risk factors and the circumstances surrounding overdose (such as location, presence of others, actions taken by witnesses etc). Risk factors include: unknown purity of heroin, using alone, mixing heroin with other drugs, low tolerance (including a recent period of abstinence), and being in a hurry to complete injecting (for examples from Australia, Spain, Italy, UK and USA see Darke & Hall, 2003; Darke, 1996; Brugal, 2002; Latkin, Hua & Tobin, 2004; O'Driscoll, McGough, Hagan, Thiede, Critchlow & Alexander, 2001; Powis, Strang, Griffiths, Taylor, Williamson, Fountain & Gossop, 1999; Rocchi, Miotto & Preti, 2003; Zador, Sunjic & McLennan, 2001). Research has also found that most heroin users have experienced an overdose and witnessed overdoses (for example Best, Man, Gossop, Noble & Strang, 2000; Davidson, 2002). Finally, there is a literature examining the ways in which drug users respond to an overdose (for example Best, Gossop, Man, Stillwell, Coomber & Strang, 2002; Beswick et al., 2002; Seal et al., 2003). An important consideration in the delivery of overdose prevention interventions is the drug users' network. Latkin, Hua and Tobin (2004) demonstrated the importance of social network over and above other factors related to overdose.

In a paper on these issues, Hall (1999) identifies 5 strategies: peer education; opioid maintenance treatment; improving responses by witnesses; training drug users in CPR; and distribution of naloxone (Hall, 1999). Here we have classed them into two groups: (i) information, training and intersectoral approaches and (ii) peer-administered naloxone.

Information, resuscitation training and intersectoral approaches

One overdose prevention intervention is the provision of information. Known risk factors for overdose can be used to tailor appropriate educational and informational materials that are distributed to injecting drug users through existing services (such as NSP) or through targeted campaigns. Strategies that can be done to reduce the risk of overdose include: having half first; using with others, letting others know you are using, calling an ambulance, not mixing drugs, tasting first, asking dealer about the gear.

Training of peers in first aid and CPR are also important strategies. Most of the documented literature includes these as part of an overall approach. There have been no direct evaluations or trials of the effectiveness of CPR/resuscitation training for peers.

The two other strategies that have been reported in the literature are: support services delivered to recent victims of overdose; and collaborations between user groups, police and emergency services to increase the likelihood that users will call an ambulance. Whilst there has been broad support for these approaches and some positive process evaluations (for example Ali, 2000; Dietze, Fry, Rumbold & Gerostamoulos, 2001; McGregor, 1999) the research evidence regarding their effectiveness is limited (Hargreaves, Lenton, Phillips & Swensen, 2002).

Peer-administered naloxone

Naloxone is a short-acting opioid antagonist that reverses the immediate effects of heroin. It is available to be administered by emergency medical personnel (and is administered via injection). One promising but controversial strategy has been to provide naloxone to drug users and/or their family and friends. Drug users and their close associates are the most immediate witnesses to an overdose, and would be in a position to administer naloxone rapidly after an overdose.

It is a controversial intervention and not without complexities. There are arguments that provision of naloxone may undermine or negate resuscitation efforts such as CPR or calling an ambulance (and may hence be more risky if used in circumstances where it would be preferable to manage the airways or seek medical help). There is also some question as to whether it would lead to riskier drug use on behalf of users (knowing there is an antidote immediately available). These fears are not without substance, as demonstrated in the work by Seal et al. (2003). Polydrug use is the norm and the naloxone has no ability to reverse non-opioid overdoses. There are also medico-legal concerns about naloxone provision – for example in Australia the ‘script’ for naloxone would need to be written for the patient, but the patient would not self-administer the naloxone in the event of an overdose (his/her naloxone would be administered by a bystander). In an analysis of the potential legal issues surrounding naloxone provision to drug users, Burris argues that the legal risks are low (Burris, Norland & Edlin, 2001. See also Oldham & Wright, 2003 for a UK perspective). The potential for serious adverse events arising from peer-administered naloxone has also been raised as a concern. Although there is no direct research testing this, in relation to medical administration, the risk of serious adverse events is very small (Buajordet, Naess, Jacobsen & Brors, 2004).

Despite these concerns, most analysts who have considered all the issues argue that peer-administered naloxone is certainly worthy of research and that the potential benefits are likely to outweigh the risks. There have been a number of published calls for a trial of distributed naloxone amongst drug users (Darke & Hall, 1997; Lenton & Hargreaves, 2000; Strang, Darke, Hall, Farrell & Ali, 1996). Currently there are only 3 places around the world where naloxone is legally available to drug users: in Italy (over-the-counter sales), Jersey, and Berlin. There are reports of underground distribution of naloxone in San Francisco and Chicago (Lenton, 2003). The importance of combining training in resuscitation and airways management with provision of naloxone is now regarded as essential (Hargreaves & Lenton, 2003; Hargreaves & Lenton, 2001).

Strang and colleagues (1999) examined the acceptability of naloxone provision to drug users. They confirmed that most drug users had witnessed a heroin overdose of which one third had witnessed a fatal overdose. The vast majority of respondents (89%) said that they would have administered naloxone if it had been available. Strang et al. (1999) estimated that “at least two-thirds of witnessed overdose fatalities could be prevented by administration of home-based supplies of naloxone” (p.199). Likewise Seal et al. (2003) reported positive attitudes by drug users to the availability and use of peer-administered naloxone. Coffin et al. (2003) found that around 30% of medical practitioners would be willing to prescribe peer-administered naloxone to drug users.

In Australia, there have been two comprehensive feasibility reports on peer-administered naloxone, both of which recommend a trial (Hargreaves & Lenton, 2003; Hargreaves & Lenton, 2001). Australia is yet to proceed with a trial.

In light of all the above research on acceptability, legal issues, risks, potential for effective reduction of overdose, and feasibility research, what does the research evidence tell us about the safety and efficacy of naloxone provision? Unfortunately very little.

From Germany (Berlin) there are descriptions of the program. For example with 124 participants who received resuscitation training and supplies of naloxone, there were 29 occasions of naloxone use over a 16 month period. Naloxone use was judged as appropriate in almost all the cases (90%) (Dettmer, 2000; Dettmer, Saunders & Strang, 2001). Over a subsequent 16 months in Jersey, 101 drug users were provided with resuscitation training and naloxone, with 5 occasions of use and no adverse events (Dettmer et al., 2001). This BMJ publication was not without its critics (the interested reader is referred to the published comments in BMJ). There are no other reports of evaluations of peer-administered naloxone.

Conclusions

Non-fatal and fatal heroin overdose are significant harms arising from injecting drug use, and as such deserve to receive a substantial focus within harm reduction interventions. Curiously, there is limited research on effective overdose prevention strategies. Program descriptions for CPR training and intersectoral approaches to improve overdose management can be found in the literature, but there was not a single evaluation of the efficacy or effectiveness of these approaches. A relatively new intervention, naloxone distribution to injecting drug users, has gained attention. It remains an untested but theoretically promising harm reduction intervention. Aside from the obvious need to conduct a rigorous clinical trial of safety and efficacy, other avenues in relation to naloxone provision that are worth exploring include non-medical frontline worker administration of naloxone and alternate administration mechanisms such as intranasal spray. Administration of naloxone by people other than injecting drug users and medically trained personnel is certainly possible. Training in resuscitation and administration of naloxone could be provided to health outreach workers, including NSP workers, security personnel, public toilet attendants and council workers. There has been no documented experience with these groups of non-medical front-line personnel in the use of naloxone. The development of an intranasal naloxone spray is underway (in Melbourne, Australia) and pilot data show promise. The use of an intranasal administration mechanism may overcome many of the fears, medico-legal issues and some of the safety concerns in relation to peer-administered naloxone.

LEGAL AND REGULATORY FRAMEWORKS

There is a set of harms arising from the illegal status of drugs. These harms are largely accrued by the drug user and include imprisonment and loss of liberty, a criminal record (which leads to difficulties with employment etc.), developing criminal experience, and associating with criminal networks. In addition corruption and the presence of black markets are harms borne by the community. The potential for blood borne virus transmission is also associated with the illegal status of drug use (hurried, inadequate injecting practices for fear of detection; and illegality of injecting equipment in some countries/states).

Thus, one way of reducing the harm associated with injecting drug use is to change the legal frameworks. Consistent with our definition of harm reduction, these interventions are not designed to reduce the amount of drug use (and indeed some argue they have the potential to increase drug use) but to reduce the harms arising from drug use.

There is a spectrum of legislative and regulatory strategies. At one end is full legalisation and at the other is full prohibition. In between these two extremes there are a number of other possibilities: prescribed availability (such as for registered drug users), licensed availability (such as occurs with alcohol); and various versions of decriminalisation of drug use ('dejure' and 'defacto' depenalisation, partial prohibition, cautioning and diversion schemes).

MacCoun and Reuter (2001) have published a comprehensive analysis of these different drug control regimes and the likely impact on use and harms of the different models. They concluded that use and dependency would increase under a legalisation model; that for heroin, providing prescribed heroin to registered users posed little risk and may significantly reduce harms; and that for cannabis there was no evidence that depenalisation would create more harms (MacCoun & Reuter, 2001).

The vast majority of the literature in the area of legalisation and regulation is concerned with cannabis. DPMP has focussed on injecting drug use, and so discussion of cannabis and the legal and regulatory frameworks will not be undertaken here. Needless to say there is an emerging literature on the impact of legislative change in relation to cannabis that demonstrates that removing the criminal sanctions surrounding cannabis use reduces the harms to the users, and does not produce increases in cannabis use. "Taken as a whole, this research finds that removing criminal penalties for cannabis possession and use does not result in higher rates of cannabis use in the general community" (Hunt, 2003, p.24. See also Lenton, 2003 for a summary).

In an area that is peculiarly American, the legal and regulatory frameworks surrounding access to injecting equipment has been well-studied. Syringe prescription laws, pharmacy regulations and drug paraphernalia laws all impact on access to needles, syringes and injecting equipment. For descriptions of the various legal and regulatory regimes in the USA, see Burris et al. (2002) and Burris, Strathdee and Vernick (2003). In these comprehensive reviews, Burris et al. (2002) note the complexity of the law and the substantial state variations, as well as interpretative differences between states.

Publications document the harms that can result from these laws (Bluthenthal, Kral, Erringer & Edlin, 1999; Friedman, Perlis & Des Jarlais, 2001; Rich, Foisie, Towe, McKenzie & Salas, 2000); attitudes by pharmacists to changing the laws regarding availability of injecting equipment

(Singer, Baer, Scott, Horowitz & Weinstein, 1998; Zellmer, 1994); and whether new regulations increase access to syringes (Valleroy, Weinstein, Jones, Groseclose, Rolfs & Kassler, 1995).

However, the more important research questions in the USA context are whether changes to laws are effective in reducing the likelihood of BBV (ie. do they reduce syringe sharing); and do they have iatrogenic effects (ie. increase drug use)? In an early report Groseclose et al. (1995) and colleagues examined the changes in user behaviour after laws allowing sales of needles/syringes from pharmacies were introduced in Connecticut. They found significant decreases in syringe sharing and a decrease in police needlestick injuries (Groseclose et al., 1995). Other research with positive findings cited in Burris et al. (2002) from Washington and Connecticut demonstrated reduced risk behaviour. However, in a similar study in Minnesota, Cotton-Oldenburg et al. (2001) conducted a pre-post evaluation of the impact of pharmacy sales of syringes. Whilst drug users did purchase syringes from pharmacies after the new laws were introduced, there was no change in carrying used syringes, nor reuse of syringes (although once variables controlled for, there was some evidence of reduced syringe sharing). “Although syringe access law is clearly an important factor in determining whether IDUs will have and use sterile syringes, it is only one of many” (Burris et al., 2002, p. 50).

OTHER

There are a number of other harm reduction interventions, which have more recently received some attention. These include pill-testing kits, rave-save interventions, and tolerance zones. The prison context has also been the subject of review and harm-reduction research.

Pill-testing is the intuitively appealing idea of providing feedback to users on the content of pills, with the goal of potentially reducing the harm from insufficient knowledge of pill content. Pill-testing has emerged in the context of increasing use of synthetic drugs and Ecstasy in particular. It is arguably less of an issue for heroin or cocaine partly because they are plant-based drugs, and partly because the user can assess the product visually. (Although it is interesting to consider purity assessments of heroin as a harm reduction measure). All of the literature we identified related to pill-testing (not powder testing).

Pill-testing is not a stand-alone harm reduction strategy (as with almost all of the interventions covered in this review), and is done in conjunction with education and information, and other rave-related harm reduction strategies. And, like other harm reduction interventions, it is not without controversy and concerns regarding iatrogenic effects (for example Winstock, Wolff & Ramsey, 2001).

There are a number of ways in which pill-testing has been identified as a harm reduction intervention. At a population level, pill-testing can lead to campaigns to warn users (via internet, bulletins etc) about particularly dangerous products. For medical emergencies, pill-testing information can be used to treat overdoses (not in relation to the specific pill consumed, but knowledge of current pills on the market and their content, coupled with user information when available describing the tablet taken, can be used to improve overdose management).

In relation to individual-level harm reduction, pill-testing at raves (on site) can provide a venue for the provision of general harm reduction information – in this sense the pill-testing ‘station’ accesses users. Pill-testing is also an opportunity to improve users’ factual knowledge about substances and risks associated with use. Finally, and perhaps most obviously, pill-testing can result in the user choosing not to consume a tablet perceived as harmful, or containing substances that were not expected or desired.

The European Monitoring Centre for Drugs and Drug Addiction (EMCDDA; Kriener, Billeth, Gollner, Lachout, Neubauer & Schmid, 2001)) completed a comprehensive review of the state of art of pill-testing as at 2001. The EMCDDA report included an inventory of pill-testing programs across the EU; discussed the goals of pill-testing; the conditions for successful implementation; legal issues; and the various analytic procedures (testing kits and laboratory testing).

As an individual harm reduction intervention, pill-testing needs to be immediate and accurate. This is currently difficult to achieve, as documented for example in the South Australian experience with pill-testing at a rave (Camilleri & Caldicott, 2005) and confirmed in the US (Murray et al., 2003). However, in Europe, on site use of more sophisticated testing equipment (HPLC) overcomes this problem (Kriener & Schmid, 2005).

Since 1992, the Netherlands has had pill-testing available to drug users as part of a surveillance and harm reduction program (Spruit, 2001). Using both on-site and laboratory-based analytic procedures with a turn-around time of a few days, the system in the Netherlands appears to

operate more as a potential “warning system” leading to campaigns about particularly dangerous products, rather than an immediate harm reduction interventions for individuals.

The evidence for the effectiveness of pill-testing is limited to date. The EMCDDA report (Kriener et al., 2001) notes that the numbers of users coming to a pill-testing ‘station’ are greater than those who attend the regular harm reduction ‘station’. It does appear that pill-testing may access users.

As a population-level warning system, Spruit (2001) cites positive findings in relation to changes in the market, that is, those products that were identified as particularly dangerous and the subject of warning campaigns, were eliminated from the market. The Berlin and Swiss projects reported that the actual ingredients of tested pills corresponded more and more to the expected ones over time – suggesting that pill-testing might have the ability to change the black market in positive ways (Kriener et al., 2001). But this trend in improved “quality” cannot be directly attributed to pill-testing.

In relation to actual behaviour change, the evidence for pill-testing is limited. In one positive report from the *cbEck iT* project in Austria, 50% of people said the results affect their consumption; most users will wait for a result before taking the drug; and when presented with a ‘bad result’, 2/3rds say they will not consume the drug and will warn friends (Kriener & Schmid, 2005). The same evaluation also reported that in the absence of pill-testing 30% of users said they would take a pill without considering the effect, 25% would ask a friend and 23% would try and test it out themselves (eg taking a bit less).

In an evaluation of the Netherlands Safe House Campaign, van de Wijngaart, Braam, de Bruin, Fris, Maalste and Verbraeck (1999) found that most users had never had their pills tested (53%). Indeed, on any one night, only about one quarter of users actually made use of the pill-testing services. Whilst almost all of those users interviewed appreciated the presence of the campaign, the vast majority said it had no effect on their behaviour (84%). (van de Wijngaart et al., 1999)

One of the concerns raised about pill-testing are the potential negative effects - increases in use or inaccurate perceptions of safer use. Winstock et al. (2001) argue that “it gives an artificial shine of safety to a group of diverse drugs that remain both illicit and potentially harmful” (Winstock et al., 2001 p. 1139). Unfortunately, we do not have direct evidence of negative effects. Spruit (2001) cited reports that studied the potential negative effects and concluded that “such an effect proved highly unlikely”. As noted above, Van de Wijngaart et al. (1999) found that 84% of their respondent stated that pill-testing had no effect on their behaviour, arguably demonstrating that it does not increase drug use. However, in a survey of non-drug users (US college students), 19% reported that they might be more likely to try ecstasy if *Dancesafe* were present (Dundes, 2003). This points to a potential iatrogenic effect, although sampling of non-users is problematic, as it does not reflect actual behaviour, and may have a strong respondent bias effect.

In summary, pill-testing remains a controversial harm reduction intervention, with limited evidence to date of either effective behaviour change in users or strong evidence for iatrogenic effects. The use of pill-testing to influence the black market appears to have some evidentiary support. Likewise, access to users through pill-testing services may enable the provision of effective harm reduction information and education. In this sense, pill-testing itself may not be the ‘effective ingredient’ in the harm reduction effect, but an effective strategy to gain access to users. There is no evidence that pill-testing actually leads to changed risk behaviour.

There are a number of harm reduction interventions applied to rave or dance party events. These include provision of quiet safe space, on site education and information stalls, attention to appropriate ventilation and cooling, provision of free water, cloakrooms facilities for secure storage of personal belongings, inexpensive non-alcoholic beverages, and medical aid on standby. No evaluations with control groups or comparison data could be sourced to inform the effectiveness of these harm reduction measures.

Tolerance areas/zones are not widely described in the literature, with notable exception of Platzspitz in Zurich. The concept is that there is an agreed area of space (usually public space) where police apprehend dealers but choose to follow discretion in relation to drug users (ie. there is a tolerance policy in relation to injecting and drug use). The sites are usually also then associated with the provision of NSP and outreach-based primary health and welfare services. There is no solid evidence-base to inform the tolerance zones. Platzspitz became unmanageable and was closed in 1992, then a second attempt resulted in closure in 1995 (Riley & O'Hare, 2000).

There has been much recent focus on harm reduction programs in prison settings. Numerous studies across all continents have demonstrated that prisoners are at substantially higher risk of blood borne virus infections and that prison environments are a strong risk factor (for example see Andrus, Fleming, Knox, McAlister, Skeels, Conrad, Horan & Foster, 1989; Bird, Gore, Hutchinson, Lewis, Cameron & Burns, 1997; Dolan & Wodak, 1999; Hammett, Harmon & Rhodes, 2002; Horsburgh, Jarvis, McArther, Ignacio & Stock, 1990; Macalino, Vlahov, Sanford-Colby, Patel, Sabin, Salas & Rich, 2004; Mahon, 1996; Malliori, Sypsa, Psychogiou, Touloumi, Skoutelis, Tassopoulos, Hatzakis & Stefanis, 1998; Martin, Cayla, Moris, Alonso & Perez, 1998; Rotily, Weilandt, Bird, Kall, Van Haastrecht, Iandolo & Rousseau, 2001; Smith, Mikl, Truman, Lessner, Lehman, Stevens, Lord, Broaddus & Morse, 1991).

There have been a number of reviews of the issues associated with implementing harm reduction programs within prison settings (for example see Braithwaite & Arriola, 2003; Central and Eastern European Conference on Drug and Infections Services in Prison, 2003; Dolan, Rutter, Wodak, Hall, Maher & Dixon, 1996; Eyland, 1996; Hughes, 2003; Hughes, 2000a, 2000b; Nelles, Fuhrer, Hirsbrunner & Harding, 1998; Stover & Nelles, 2003).

The harm reduction interventions that have been trialled or established in prisons include provision of voluntary HIV testing, education and counselling; provision of bleach; needle exchange programs; provision of condoms; and provision of opioid replacement pharmacotherapies. There have been a limited number of evaluations of these interventions, but all with positive results in relation to reducing risk behaviour and no evidence of iatrogenic effects (see Black, Dolan & Wodak, 2004; Dolan, Rutter & Wodak, 2003; Goldberg, Taylor, McGregor, Davis, Wrench & Gruer, 1998; Jacob & Stover, 2000; Nelles, 1999; WHO, 2004b).

Finally, there is no evidence that bleach or other forms of disinfection are effective in reducing HIV infection (WHO, 2004a).

SUMMARY AND CONCLUSIONS

Harm reduction is a vital part of a comprehensive approach to drug policy. The DPMP has distinguished harm reduction from law enforcement, treatment and prevention approaches. Harm reduction here has been defined as those policies and interventions aimed at reducing harm, and excluding those interventions that reduce use (and hence harm). Therefore, this monograph considered the following as harm reduction interventions:

- Needle syringe programs
- Supervised injecting facilities
- Non-injecting routes of administration
- Outreach
- HIV education and information and HIV testing and counselling
- Brief interventions (aimed at harm reduction)
- Overdose prevention interventions
- Legal and regulatory frameworks

The key features of harm reduction include: a focus on harms rather than use; a pragmatic and achievable approach; an assumption that drugs are part of society; an underlying public health framework; and the use of an evidence-base to evaluate interventions in relation to their impact on net harm.

Harm reduction describes both an overall policy approach, as well as a set of specific interventions. Evaluating the overall policy approach is complicated – country comparisons are difficult to conduct; there are many variables that may moderate the relationship between a country's policy stance and policy implementation; and there are a large number of confounds. Harm reduction can however be readily evaluated in relation to the efficacy and effectiveness of the individual interventions that comprise a harm reduction approach.

The needle syringe program literature is vast with many program development and descriptive reports. Aside from this, we identified 120 relevant publications that tested the efficacy or effectiveness of NSP (out of a total of 344). In itself, the significant amount of NSP evaluation literature is interesting. Perhaps because NSP are perceived to be controversial, there has been investment in evaluation. The research designs have varied between studies and the outcome measures have variously included reduced risk behaviour; reduced HIV seroconversion, and reduced HCV seroconversion. But the overall conclusion is strong – there is significant support for the efficacy, effectiveness and cost-effectiveness of NSP.

As noted in the body of the report, NSP stand out as having one of the strongest evidence-bases across all areas of illicit drug policy. So it is striking that there continues to be negative commentary around NSP and a desire to interpret single studies as evidence of ineffectiveness rather than using the full literature base. This stance appears to be driven from an ethical or moral position and is inconsistent with the evidence-base.

Despite the substantial evidence-base for NSP, they cannot be considered a stand-alone strategy. The integration of a number of harm reduction interventions will produce the greatest impact. Other harm reduction strategies that we review include supervised injecting facilities. Like NSP, these are somewhat controversial, and unlike NSP, there is a very limited evidence-base upon which to judge efficacy or effectiveness. SIF have been credited with a number of public health

and community benefits such as prevention of overdose, reduced transmission of BBV, improved public amenity and facilitation of access to medical, welfare or treatment services. We await with interest the emerging research (for example from Canada) that will add to the body of knowledge. Until more studies are completed, one cannot be definitive about the effectiveness or efficacy of SIF.

Non-injecting routes of administration (NIROA) does appear to be a promising harm reduction avenue, worthy of further exploration. Likewise the recent interest in pill-testing will hopefully stimulate controlled evaluations of the impact (both positive and negative) on party drug use.

Outreach has been identified in the USA and perforce UN and WHO publications as a central harm reduction intervention for blood borne viruses. The emphasis is not misplaced, with reasonable evidentiary support for outreach. Interpreting the strength of the evidence is complicated by the fact that the outreach models are multifaceted interventions. Hence one may not be able to isolate the ‘active ingredients’.

Harm reduction reviews do not often include the more traditional blood borne virus interventions such as HIV education and information, and HIV counselling and testing. Education and information are intuitively appealing harm reduction interventions, and are likely to be among the less costly interventions. Unfortunately these positive aspects are not matched by effectiveness. There is an important role for the provision of voluntary HIV and hepatitis testing and associated counselling for the purposes of screening and early access to treatments. Whether such services actually reduce risk behaviour seems equivocal.

Brief interventions, including motivational interviewing, skills training and other cognitive behavioural approaches have received minimal attention as harm reduction interventions. This should be rectified with future research, given the known efficacy of brief interventions for various other behaviour change endeavours.

Overdose prevention interventions have included CPR training, intersectoral approaches to improve overdose management, and naloxone distribution to injecting drug users. Most recent attention has focussed on the last intervention – naloxone distribution to injecting drug users. It remains an untested but theoretically promising harm reduction intervention.

Harms arise from the illegal status of drugs and drug use. Thus, there are a number of harm reduction interventions that involve legislative or regulatory interventions. This area is complex and our review did not thoroughly uncover and evaluate all the legislative and regulatory options. We have largely relied on the analysis by MacCoun and Reuter (2001). It is apparent that the key issue in evaluating different legislative or regulatory options is consideration of the decrease in harms to users in association with the potential increase in numbers of users.

One of the goals of DPMP is to develop systems models of the dynamic interactions between law enforcement, treatment, prevention and harm reduction interventions. In order to ground these dynamic models, we require good information about the effect of interventions. This systematic review, along with those completed in law enforcement, treatment and prevention provide the building blocks for such models, enabling a comprehensive approach to formulating illicit drug policy in Australia.

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