

HIV and HCV Transmission Among Intravenous Drug Users

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Abstract

This paper examines the evidence for harm reduction policies on HIV and HCV transmission, evaluating the benefit to drug users and the community. Surveys show that HIV is primarily transmitted through unsafe sexual activity, while HCV is almost exclusively transmitted by unsafe drug injecting. A review of studies on NSPs and their effectiveness in preventing transmission of HCV and HIV shows there is insufficient evidence to demonstrate any benefit. Consequently, prevention should target those at risk of acquiring the viruses and providing education, risk reduction counselling, HIV and HCV screening and substance abuse treatment. For HCV, counselling should be focused on drug treatment, while for HIV the focus of prevention should be on screening and education of safe sex practices. Counselling needs to focus on reducing the risk of HIV and HCV transmission to others, as well as treatment, safe sex and drug use practises such as reducing alcohol usage and reducing exposure to other STDs.

Preface

The aim of this paper is to examine the evidence found in the published scientific literature relating to Human Immunodeficiency Virus (HIV) and Hepatitis C Virus (HCV) transmission among intravenous drug users (IDUs) and the impact of harm reduction (HR) policies that are

designed to reduce transmission of these diseases. Following from this, this review aims to evaluate the benefit to drug users and the community that has accrued from these policies.

Some introductory observations are required. Firstly, the claims of scientific evidence for harm reduction strategies need to be scrutinised carefully as such claims are highly influential with politicians and policy makers. Secondly, in the absence of scientific evidence certain unfounded assumptions about the transmission of these diseases can be wrong and give rise to policy decisions with no proven benefit in terms of a healthier community or of financial savings to the community.

Following the introduction, this review explores how viral diseases are transmitted, the diversity of these vectors, the influence of policy and culture and the distinction between HIV and HCV, particularly the way in which they are transmitted, then examines the evidence that bears on the question as to the impact HR policies, particularly needle exchange programs, have had on transmission rates. In conclusion, evidence-based practices centred on prevention and treatment are recommended.

Introduction

Since the early 1980s there has been a largely uncritical acceptance among health authorities that the introduction and funding of harm reduction (HR) measures among intravenous drug users (IDUs) is an important strategy to prevent the transmission of blood-borne viruses. This is evidenced by the lack of discussion, debate or consideration of alternative policies. The main motivation for the urgent implementation of these policies was the threatened transmission of HIV and HCV among IDUs through unsafe injecting practices, mainly via

sharing of needles and injecting equipment within this community and the wider community with whom they may interact.

The main strategies implemented have been the provision of sterile needles and syringes, often in exchange for used items, the provision of long-acting and supervised substitute opiates (methadone and buprenorphine) and in some cases supervised injecting facilities that sometimes included medical support in the event of overdose, provision of information on safer injecting techniques and on other risky behaviour as well as information about treatment options. Needle exchange and opiate substitution programs were introduced on the basis that they intuitively made some sense, particularly in the face of concerns that HIV would become a pandemic and spread to the wider community. When these programs were introduced there was no evidence to support them or to indicate that they may cause more harm than good. Central to HR thinking is that these strategies need not necessarily seek to reduce frequency or duration of injecting drugs but to minimise harm among those who continue to practice these risky behaviours.

In contrast to these HR approaches other approaches aim to reduce the harm associated with the use of dangerous and illicit drugs through the reduction in supply and demand for drugs through various means such as law enforcement and interdiction of supply as well as education and treatment with a primary aim of getting people off drugs and curtailing the use of drugs in the community. These latter policies have been shown to reduce supply and drive up prices of illicit drugs. Treatment modalities have been successful in separating addicted people from their habit which remains the most effective method of reducing transmission of blood-borne disease. They have also been shown to reduce demand and to reduce overall drug use. In response, some questions have been voiced concerning the violation of drug

users' rights to use drugs and be free of the threat of criminal sanction and of coercive treatment.

There are a number of aspects of HIV and HCV infection that have presented challenges to accurate forecasting and estimation of incidence among stigmatised minority populations and hence to the accuracy of surveillance and monitoring techniques. Firstly, surveillance and monitoring of HIV and HCV has been integrated to varying degrees in countries that have developed surveillance policies. Secondly, even where monitoring has been vigorously pursued detection of incident cases of infection is difficult because less than 10 percent of people who are exposed to HIV develop symptoms associated with AIDs, 25% exposed to HCV develop acute hepatitis, and an even smaller proportion seek medical advice. New infections can be detected serologically, but this requires serial testing of individuals within a limited time period to determine that antibodies have developed. Thirdly, because HIV and HCV infection in Australia and many other countries is strongly associated with risky sexual practice and the illegal and socially stigmatised practice of injecting drug use, it is difficult to undertake monitoring of a large group of people who are at risk of infection. Finally, the long (over decades) and variable time course of chronic infection complicates the assessment of outcomes such as associated diseases (1, 2, 3).

Not only are these infectious diseases recent (emerging in the West in the early 1980s), the spread rapid and for millions of infected people and their communities there are serious health and economic consequences, it also demonstrates a high level of complexity and variance in the factors contributing to the dispersal of the diseases from one locale to another (4, 5). This occurs, in part at least, as a result of the rapidly evolving replication, mutation and recombination rates, population growth and turnover of the RNA viruses that inhabit neurons

of the host organism and can result in persistent infection and lie dormant for lengthy periods before emerging as AIDS or liver failure and liver cancer (3, 6, 7). In turn the environment can be altered by the action of the parasite on the host population due to mortality and acquired immunity and public health and political interventions. This interaction between the change in parasite genetic structure and host contact and on host behaviour and movement are all impacted by a variety of environmental factors that vary from place to place and from time to time (4, 5).

Countries and regions vary in fundamental ways in terms of the origins of blood-borne viral diseases, the pre-existing prevalence before introduction of HR policies, lifestyle and cultural factors and attitudes to drug use and risky sexual behaviour that may foster or impede transmission rates. For example, sub-Saharan Africa has by far the greatest prevalence of HIV in the world with approximately two thirds of the 23 million people living with HIV residing there and yet this region has one of the lowest rates of IDUs, with very similar prevalence of HIV among this group compared to other countries. These factors pose some very significant problems in terms of understanding the dispersal of these diseases, the different patterns and rates of infection and prevalence and how and why they vary effecting efforts at prevention. On the other hand the nature of the transmission of these micro-parasites means that spread is initially confined to local contact processes within tight social clusters meaning that patterns and factors involved in transmission can, in theory, be subject to modern phylogenic and epidemiological investigation of parasites, vectors and hosts to identify heterogeneity in the host structure, therefore allowing researchers to potentially identify specific transmission factors in discrete clusters that can be targeted and subject to intervention (8, 9).

A major factor in the prevalence of either disease appears to be the infection rate prior to identification and the prevention measures that are instituted. HIV was identified in Africa and Western countries at around the same time (1980s), and tests for HCV were only available after 1989. In Australia in 2000, just over 20,000 new cases of hepatitis C infection were reported. Surveys have found that the highest prevalence in Australia occurs in people with a history of injecting illicit drugs. Other groups with high rates of hepatitis C infection are people with haemophilia, prisoners and people from countries with a high prevalence of hepatitis C. HCV had by 1989 already infected large numbers of IDUs and its containment has not been possible despite the implementation of prevention programs (3). By way of contrast the prevalence of HIV in Africa was well established and the means of transmission widespread, while in Australia few cases were reported, largely confined to a particular homogenous group, and well contained with few new infections each year with the early introduction of preventative strategies based on safe sex education and provision of condoms.

These differences highlight the need to make a clear distinction between the transmission of HIV as opposed to HCV. Because they are both blood-borne viral diseases the assumptions often made are that they are similar in the way they are transmitted and that similar policies or strategies will have the same impact on infection rates. In Australia there was an estimated 20,171 people living with HIV and 211,000 with chronic HCV at the end of 2009. More particularly, it is well understood that in Western countries HIV is predominantly transmitted by unprotected anal intercourse often in the presence of other sexually transmitted diseases (STDs) and that transmission by needle sharing is minimal with an estimated transmission rate of 3-4% (10).

Conversely, it is well established that HCV is transmitted largely as a result of risky injecting practices among IDUs and the use of contaminated blood during medical procedures. Transfusion of blood products has been a leading cause of transmission of HCV; however, due to improved screening, transmission through transfusions has decreased in most developed countries. This has meant that some countries have had a high underlying prevalence rate. The evidence supports the theory that sexual transmission of HCV is rare but curiously is higher among those with high-risk sexual activity. Further to this, an injecting drug user sharing an unclean needle used by another injecting drug user of unknown infection status is at 150-800 times higher risk of infection with hepatitis C than HIV. The likelihood of HIV infection after being injected by a needle from a HIV positive person was estimated to be 0.3%, or one in 316 occasions, compared to the risk of contracting hepatitis C (up to 7%) and hepatitis B (23% to 37%). Unlike HIV, HCV is found in high concentrations in filters, spoons, and rinsing liquids that may be used in association with needle drug use. The probability of becoming infected with HIV compared to hepatitis C or hepatitis B is very much lower as HIV is a fragile virus once outside the body, especially when exposed to unfavourable environmental conditions (11, 12, 13).

What has obscured the above differences is the fact that most countries employ a varying mix of prevention strategies often without any clear distinction between which policies are more effective for each disease. Therefore it is difficult to disentangle the effectiveness of particular approaches to reducing drug use, reducing risky behaviour and ultimately reducing the transmission of blood-borne viruses among those practising unsafe casual sex and using drugs intravenously, therefore making conclusions about the overall reduction in harm to the community difficult. Australia, for example, implemented a tough on drugs program in the 1990s. The evidence was convincing that there was an overall reduction in drug use and

related harm, particularly of intravenous heroin use. Opiate overdose deaths fell from 1115 per year in 1999 to just over 300 per year by 2004. Australia also has a very well-funded and widely available Needle and Syringe (NSP) and Opiate Substitute Treatment (OST) Programs and yet, despite these clearly preventative factors, HIV incidence has increased in recent years, suggesting that intravenous drug use and interventions which target it have little relevance. A similar increase in HIV prevalence among IDUs has occurred in Switzerland where very widespread and well-resourced harm reduction programs were implemented many years ago including the legal provision of injectable morphine to long-term addicts.

On the other hand, with some of the most comprehensive HR programs in the world, the prevalence of HCV in Australia is as high, or higher, than many other countries, which have not adopted these harm reduction strategies to the same extent. Yet the latest research from Russia, which bans the use of opiate substitution treatment with non-existent needle exchanges, indicates that there has been a significant fall in HIV prevalence among IDUs in the period 2008 and 2011. These counter-intuitive results raise questions regarding the adopted HR strategies. A recent study in London, England examined 428 intravenous drug users below the age of 30 and found that 44% had antibodies to hepatitis C compared to 4% with HIV. To make the distinction clear, it is estimated that 81% of existing hepatitis C infections are due to unsafe injecting practices, reaching saturation levels after 6 years of injecting suggesting that NSPs have had negligible impact on the spread of this disease, whereas only 3 to 4% of HIV transmission is thought to occur due to needle sharing among IDUs (13, 14, 15).

While some studies indicate that risky behaviour of people attending NSPs decreased or at least did not increase, no studies have found convincing evidence that transmission rates of

HIV have consequently been impacted (16, 17). Most importantly, studies suggest that injection risk-taking and HIV transmission are not necessarily related. For example, in jurisdictions in the United States where drug paraphernalia laws were strictly enforced, a higher prevalence of HIV infection was observed despite lower risk taking behaviour. In cities in Canada with the highest concentration of needle exchange programs, studies found higher rates of HIV than among those not attending needle exchanges and hence sharing needles more frequently. The evidence is that factors other than access to free needles and syringes drive HIV transmission (18).

Yet despite such clear differences to the transmission of HCV, the approaches to both blood-borne diseases have remained similar. HR policies have been implemented, often in defiance of surveyed public opinion, and then maintained without scientifically-evaluated studies that support their effectiveness.

HIV: Prevalence, Patterns and Rates of Transmission

In southern Africa the incidence of HIV/AIDS is much higher than any other region of the world with some two thirds of all known cases being from this geographic area characterised by the HIV-1 strain and with many sub-types (M,N and O) and variants (4, 7,19). Of all new HIV infections that occurred in 1999, over 70% of new infections were in sub-Saharan Africa with over 90% of HIV-infected adults in African having acquired their infection through heterosexual intercourse (4, 7). The origins of the disease appear to be by zoonotic transfer between simian species and humans in areas of Africa where monkeys are a source of wild meat and are kept as pets. Human infection with at least two strains and many sub-types of Simian Immunodeficiency Viruses (SIVs) are thought to have resulted from exposure of coetaneous or mucous membrane to infected blood during the hunting and butchering of

monkeys (mainly chimpanzees) for food and also through contact with urine and faecal matter and bites from pets (4, 7, 20, 21). Geographical factors such as rivers and mountains have contained the spread in some regions and demonstrated through parasitic population genetics the temporal and spatial spread of infection into different host populations, while socioeconomic change has hastened the spread of the disease among human hosts (9, 21, 22).

Of the 22.5 million people infected, prevalence and rates of infection vary from one country to another and from one population centre to another within countries. A number of factors have contributed to this variation - temporal (time since the first infections in the population and viral load), social (incidence of prostitution, prevalence of other STDs, age from first intercourse, use of condoms) and cultural (break down in traditional practices, number of men circumcised) (4, 7, 9, 10, 23). Not only is the spread by way of heterosexual intercourse, in many regions higher proportions of women (up to 31.9% in parts of Cameroon), particularly young women, are infected compared to men (23.2%) in both the general population and among sex workers (up to 76.8% from the same population centre) (21).

While in Africa the first cases of AIDS were detected in 1983 and the origins appear to be much earlier and were attributed to zoonotic transfer, in Eastern Europe the history and course of the disease provides a startling contrast, although some dispersal factors are similar, and therefore provide some insights into preventative stratagems. In Eastern Europe there has been an unprecedented surge in infection in recent times with a five times increase in new HIV infections detected between 1995 and 1997 from under 30,000 to over 150,000 in this short period accompanied by extensive HIV testing in most countries, thus allowing early detection and reasonably accurate demographic profiling. This upsurge in infections corresponded with the fall of the centralised command economies and the subsequent

dramatic fall in GDP and economic and social disruption in Russia and in the Newly Independent States (NIS) (22, 24). The authors suggest that this socioeconomic change has been accompanied by a shift in values from a collectivist mentality to individualism and consumerism and a move toward unsafe sex and drug using behaviour among other changes, although, as in many other countries, tolerance of these shifts in attitudes and behaviours are still not readily accepted (25). The general factors that have been identified as causing this rapid spread of the disease include: widespread poverty and unemployment, migration due to economic hardship and civil conflict, disruption of family and community life and drastic reductions in health and social services. Specific factors that are typical of some regions and not others have been identified: a rise in numbers of women engaged in sex work due to poverty and exploitation; the continued repression of men having sex with men (MSM) and unsafe sexual practices due to ignorance and reluctance to access health services with an accompanying upsurge in STDs and finally, large prison populations exposed to infection due to unsafe sexual practices between men. This is exacerbated by the lack of sex education, harm minimisation policies and of availability and access to quality condoms, and an understanding of the need and a willingness to use them (22, 23, 24, 26).

However, in the Baltic States, where economic disruption has not occurred to the same degree, the same pattern of HIV transmissions as in Europe and North America is seen with 70 to 85 percent of all AIDS cases related to homosexual transmission. In the Newly Independent States (NIS) in Eastern Europe, some 50% of transmissions are due to MSM behaviour, where ignorance of HIV transmission, safe sex practice and social stigmatisation and repression are still common. In Russia, 45% of transmissions are related to MSM compared to 25% for heterosexual transmission, although in recent times (since 1996) IDU and heterosexual transmission has outnumbered homosexual transmission. In this

environment the major social components affecting interventions are largely political and social as homosexual behaviour is still regarded as anti-social even if it is not illegal any more. Such repression and systematic victimisation has led to reluctance to openly seek preventive measures or treatment and is often characterised by denial of the risks and ignorance of risk factors and means of prevention, such as condom use, which is probably the most effective of prevention measure with estimates that 80% of transmissions can be prevented by their use even among IDU groups. Hence, international HIV prevention programs have focused on the MSM populations, recognising the potential for rapid spread in this group and then into the heterosexual community (22, 24, 26).

In Australia, Western Europe and North America, most of HIV infections are transmitted between MSM and are of the type B variant (HIV-2). In Australia there was an estimated 20,171 people living with HIV at the end of 2009. However, the distribution within the population varies considerably and reflects the most common modes of transmission for each disease. In Australia only 3% of those diagnosed with AIDS in 1991 were among women. Sexual contact between men has resulted in AIDS infection in 90% of reported cases and another 4% among homosexual men who also injected drugs, particularly related to the increase in the injecting of methamphetamines among this group (27. Perry, Halkitis, Parsons and Stirratt, 2001). Only 2% occurred among men and women who injected drugs and a further 4.2% were medically acquired, which was similar to the pattern of transmission in Northern Europe and the West Coast of America (2, 8). Again the incidence varies considerably both in terms of percentage of the population infected from one country to another, for example, 2% in Australia of IV drug users compared to 40% in some areas of the USA where methamphetamine injecting among MSM is high (24, 27, 28). Where there is a considerable cross-over in homosexual populations of heterosexual behaviour (often covert)

and drug use, dissemination to other populations are by way of unprotected heterosexual sex and drug users sharing equipment, although the extent and likelihood of transfer, which varies markedly from one place to another when these conditions are extant is not known with any certainty. The actual means of dispersal is largely conjecture with few studies providing any conclusive evidence often due to the difficulty of determining actual numbers of MSM who use drugs as there remains a stigmatisation and discrimination of this group, despite recent efforts to break down prejudice, thus deterring open disclosure (22, 25). Additionally there are many who do not know they have the virus where in the US, for example, 25% are not aware (29).

In Australia the incidence of HIV among IV drug users is low. However, it is much higher among homosexual men who also inject drugs and who have other STDs and practice unsafe sex, which further confounds the actual means of transmission even though there is a much higher chance of acquiring the disease from someone who is infected if blood is the vector (8, 28). Research surveys show that sharing needles among IDUs does not significantly affect transmissions rates for HIV, which was estimated at 1.2%, while the figures for IDU men were 22.5% for MSM (men who have sex with men) and 0.7% for heterosexual men with an estimated sharing rate of 31%(30). This seems to confound the relationship between needle sharing and MSM and suggest that unsafe anal sex is the major factor in transmission and being an IDU coincidental.

Even within countries there is significant variation in HIV prevalence, although use or non-use of condoms, even among drug users, seem to be a dominant preventative factor (26, 27, 31). In the US patterns vary considerably between West Coast populations where dispersal is predominantly among MSM while on the East Coast it is transferred most often within

heterosexual and smaller heterogeneous groups through unsafe sex with prostitutes and drug users (8).

In the UK there are two major populations exhibiting different strains, incidence and patterns of social interaction. The first is among the MSM population who carry HIV-1 type B with a large proportion sharing genetic variants among clusters of 10 people or more. Within these relatively large groups the opportunity for spread by way of heterosexual intercourse and IV drug use is higher if there is already a high incidence of risky HIV/AIDS cross-over behaviour within and outside these often closed social clusters. The other identified population carrying the HIV-2 type A variant is among those who have come from Africa. Most are not connected to any other populations with no evidence of it extending beyond single individuals, and if so, small tightly interacting groups of two or three are more likely than larger groups, which appear to be very rare. As well as HIV-2 type A being less pathogenic compared to type 1 and being transmitted less efficiently, transmission is by way of heterosexual intercourse among closely related people and rarely beyond that context, meaning that other forms of transmission are highly unlikely and therefore transfer to the broader population is less likely (7,19). While HIV and AIDS remain a major concern in the UK, with 6,393 new HIV diagnoses in 2007, HIV infection among IDUs is relatively uncommon. Only 110 (2%) new diagnoses of HIV were thought to have occurred as a result of injecting drug use in 2007 (17).

In South East Asia spread occurs most often among IDUs, sex workers and clients of sex workers with up to 80% of sex workers having HIV in India and Thailand, whereas in Vietnam IDUs have an 80% HIV prevalence (8, 24). In this area and also in China the recent emergence of HIV has been associated with the rapid rise in STDs (10, 23, 31). In Japan HIV

spread is characterised by medically acquired infections, mainly contaminated blood transfusions (8). Coincidental risky sexual behaviour and drug injecting patterns and high incidence of STDs and low condom use link populations of IDUs, sex workers and their male clients in these countries, and provide multiple opportunities for transmission of HIV with, for example, up to 25% of IDUs' wives (non-IDUs) having HIV in Vietnam (24, 31).

In each environment we see that with a range of dispersal mechanisms, some common, such as unsafe sex associated with a high prevalence of STDs, and some less common, such as medically acquired infection, the dissemination of the virus is impacted by specific environmental factors within parasitic and host populations that moderate the spread of the disease beyond the usually tight social groupings and mitigate against effective prevention. Due to a number of factors, the actual number of people in the most vulnerable groups, such as MSM and sex-worker groups, is often hard to accurately gauge as most countries do not screen for STDs or keep registers of IDU or MSM or otherwise have access to these people unless they come under criminal or health authorities notice. In countries where testing has been mandatory or a part of the health service regimes, particularly in Eastern bloc countries many people in marginal groups tend to hide their involvement in homosexual behaviour or sex work because of on-going stigmatisation, repression and in some cases criminal sanction. Trying to determine actual numbers infected with HIV also poses serious problems in countries where people are not screened or screening services do not exist - numbers are estimated by the number of people presenting to health services with AIDS. The problem is that by this time they may have had HIV for some time due to the extended asymptomatic stage resulting in rates of transmission changing quickly with the ratio of sero-conversion varying according to number of factors. Nevertheless, the pattern that seems to emerge from this overview is that those factors that initiate and promote dissemination of the disease are

multifactorial and are heavily influenced by environmental factors, although some major causative factors that occur most frequently, and may be those to be targeted for prevention, seem to be identifiable. The next section attempts to find these common factors among the demographic data that varies so much from country to country and region to region.

Notwithstanding, a complex array of socio-political factors make simple explanations and analysis difficult. For example, it could be speculated that in some countries where there is a tendency for homosexuality to be suppressed a greater leakage of the virus into the wider community through infection of sex workers and spouses is more likely. When a homosexual population is able to openly operate there is more segregation and less cross-over into the wider community. Hence from one society to another HIV transmission will tend to be more or less contained. In other countries, for example in South Eastern Asia and Africa, where prevalence is high (>3.5%) the predominant means of transmission is via poorly paid sex workers catering to a foreign clientele and having unprotected sex. The incidence of STDs is thought to be one of the major factors in transmission particularly to a receptive partner. The results of two community level randomised, controlled intervention trials conducted in Africa suggest that timely provision of STD services can substantially reduce HIV incidence (10). In both countries prevalence of IDUs is very low: 0.03% and 0.17% respectively compared to Eastern Europe, where IDU prevalence is 1.26% (15). It seems that in both cases sharing needles is not the means by which HIV is transmitted. In Australia with a much higher prevalence of IDU at 0.53% it is estimated that HIV prevalence among this group is only 1.2%. In 2003 – 2012, approximately 6% of HIV diagnoses in Australia were in people with a history of injecting drug use, of whom more than half were men who also reported sex with men. HIV prevalence among people attending needle and syringe programs has remained low (around 1% in 2003 – 2012). Of 3,293 men and 2,251 women with a history of injecting drug

use who were tested for HIV antibody at metropolitan sexual health centres in 2003 – 2012, 8 males (0.2%) and 1 woman (0.04%) were diagnosed with HIV infection. When looked at more closely it is much more prevalent among gay IDUs than heterosexual IDUs, suggesting that needle sharing is coincidental to rather than a cause of transmission: 22.5% and 0.7% respectively (28, 30, 32).

Cities such as Vancouver and Montreal have observed higher rates of HIV among NSP attendees compared to non-attendees. In Vancouver, which has the largest NSP in North America, HIV infection among injecting drug users has still spread despite NSPs. It was found that frequent NSP attendees in Vancouver were younger, significantly more likely to report unstable housing, frequent injecting, frequent cocaine injecting, involvement in the sex industry, injecting in shooting galleries and incarceration within the preceding six months while also significantly less likely to report enrolment in methadone maintenance than non-attendees. These risk factors among attendees were likely to account for the observed association between frequent Needle and Syringe Program attendance and HIV infection (33).

A cohort of people who inject drugs has been studied in where a NSP has operated since 1988. A report from this study found that attendees were more than twice as likely to become infected with HIV as non-attendees. The authors concluded that the higher rates of HIV among program attendees were associated with restrictions on the number of sterile needles and syringes which could be provided on each visit. Since attendees engaged in higher risk behaviours, including more frequent injecting than non-attendees, the authors concluded that the number of needles and syringes distributed was likely to have been substantially less than was actually required to control HIV infection. It seems however that attendees, despite

higher injecting rates, if that was indeed the case, would have benefitted from being able to obtain the needles they needed and that rates of sharing would have been less than those who did not attend and have access to clean injecting equipment. A more plausible explanation is that those attending the NSP in Vancouver and Montreal engaged in other risky behaviour, mainly risky sexual behaviour and that HIV was transmitted for this reason and that injecting practices had no significant impact on HIV transmission (34).

Recently in Australia, the incidence of new HIV infections has been rising. Authorities have been alarmed by this trend and have publically advocated for greater efforts at prevention. It is clear from all the various experts that prevention relates to changes in sexual practises among MSM (men who have sex with men). Among cases of newly diagnosed HIV infection, the proportion who acquired the infection in the 12 months prior to diagnosis gradually increased from 26% in 2007 to 32% in 2012. New surveillance reports for sexually transmissible and blood-borne infections in Australia in 2013 indicated that the incidence of HIV increased by 10% from the year before, from 1137 in 2011 to 1253 in 2012. New diagnoses rose by 36% among homosexual men aged 15-19 and by 22% in those aged 20-24 and the number of new cases was now at its highest in 20 years. Despite needle exchange, free condoms and widespread safe sex and injecting education programs this was contrary to world-wide trends that showed a decline in HIV infection (World Health Organization or WHO). Professor John de Wit, Director of the Centre for Social Research in Health at the University of NSW, said the most recent Gay Community Periodic Surveys had revealed a "concerning" rise in rates of unprotected sex, particularly among men younger than 25. The Gay Community Periodic Survey indicated that the proportion of respondents who reported unprotected anal intercourse with casual partners increased in Australia from around 20% in 2003 to around 24% in 2012, although this varied from state to state (29, 35).

In response HIV prevention strategies which aim to reduce the incidence by 50% by 2015, comprised increasing access to rapid HIV testing and antiretroviral therapy, introducing new prevention strategies such as pre-exposure prophylaxis and increasing funding for ongoing surveillance.

The experts tend to agree that transmission rates were determined by factors such as condom use, the number of sexual partners for those at risk and how transmissible HIV is. Attitudes toward condom use with casual partners put upward pressure on HIV transmission and were the major factor in new cases (32, 35).

Not one commentator mentioned the value of needle and syringe programs (NSPs) or of methadone (OST) in having any significant impact on transmission rates. Clearly needle exchange and methadone are thought to have had negligible or no impact on HIV transmission. It seems that four decades of widespread needle distribution and methadone dosing has been related to an increase in HIV, if in fact there has been any relationship at all. Of some importance, commentators failed to mention the link to STDs and HIV. Strong evidence indicates that both ulcerative and non-ulcerative STDs promote HIV transmission by augmenting HIV infectiousness and HIV susceptibility via a variety of biological mechanisms and that receptive partners with STDs may be at greater risk of HIV infection. Therefore the need is to implement prevention strategies for these diseases and to educate receptive partners about the increased risk (10).

HCV: Prevalence, Patterns and Rates of Transmission

In 1999, the WHO estimated a worldwide prevalence of HCV of about 3% with the virus affecting 170 million people worldwide. In Europe, general prevalence of HCV is about 1% but varies among the different countries. Prevalence of HCV antibody was 0.87% (1993-1994) in Belgium. In the United Kingdom, at least 200,000 adults carried HCV. In Northern Italy, prevalence of HCV was 3.2%. Three studies in Central and Southern Italy showed a higher rate of HCV (8.4%-22.4%), especially in the older population. Central and East Asia and North Africa/Middle East are estimated to have high prevalence (>3.5%); South and Southeast Asia, sub-Saharan Africa, Andean, Central, and Southern Latin America, Caribbean, Oceania, Australasia, and Central, Eastern, and Western Europe have moderate prevalence (1.5%-3.5%); whereas Asia Pacific, Tropical Latin America, and North America have low prevalence (<1.5%)(13, 36). Among Central and South America, a recent community based study in San Juan, Puerto Rico, showed that estimated prevalence of HCV in 2001-2002 was 6.3%. Since 1999, the most recent WHO estimate of the prevalence of HCV infection is 2%, representing 123 million people. China has a reported seroprevalence of 3.2%. In India one community-based survey reported an overall rate of 0.9%. Indonesia's rate is 2.1%, but is based on sero-surveys of voluntary blood donors. More thorough data exist on the seroprevalence in Pakistan, where most reported rates range between 2.4% and 6.5%. Egypt, with an estimated population of 73 million, has the highest reported seroprevalence rate of 22% among blood donors (15, 36).

The risk factors most commonly cited for the transmission of HCV are blood transfusions from unscreened donors, injection drug use, therapeutic injections and other health-care related procedures. In most developing countries the evidence shows that injecting drug use is the predominant means of transmission. In countries such as USA and Australia, where the

highest prevalence is among older people, injection drug use has been the dominant mode of transmission for 30 years, and accounts for 68 and 80% of current infections respectively. Among those with a duration of injecting of 6 years or more prevalence is up to 94%. While HIV prevalence rates remain relatively low and stable among IDU populations in the UK, the same cannot be said for HCV. The majority of the 62,424 reported laboratory diagnoses of HCV infection in England reported up to the end of 2006 were probably acquired through injecting drug use and over 90% of those diagnoses with risk factor information reported injecting drug use as the route of infection. Fewer sharing partners are necessary to sustain HCV transmission compared to other blood-borne diseases, which may also be transmitted through sharing of drug injection equipment. Occupational, perinatal and sexual transmissions are unlikely (13, 17, 36).

The extent that sexual activity plays in the transmission of HCV remains, while low, unclear. Among 1257 non-IDUs in Baltimore at a STD clinic 9.7% were positive for HCV, suggesting that many of the HCV patients had sexual partners who engaged in risky drug injecting behaviour. In one study, 15% of non-IDU women with an injecting partner had HCV. More recently, a 10-year prospective follow-up study (8060 person-years) showed no evidence of sexual transmission among monogamous couples in Italy. Also recently, there was lack of evidence found for sexual transmission of HCV among men who have sex with men in the prospective ongoing cohort study in the US (2653 person-years of follow-up). All of this new evidence supports the fact that sexual transmission of HCV is still rare but for some reason is higher among those with high-risk sexual activity (13).

By way of contrast in New Delhi, among 182 anti-body HCV-negative hospitalised patients studied prospectively following a blood transfusion, HCV infection developed in 5.4%. In

Ghana, one in 2578 donations is estimated to contain HCV. Transmission of HCV infection through occupational, perinatal, and sexual exposures occurs with much less efficiency compared with transmission through large or repeated injection or blood transfusion exposures. Thus, occupational, perinatal, and sexual transmission is unlikely to be major sources of new HCV infections, regardless of the population or geographic area. Sex with an infected partner and with multiple partners have been identified as risk factors for HCV transmission, but sexual transmission of HCV is far less efficient than that of other sexually transmitted viruses. Among HIV-positive people with a history of injection drug use, the coinfection prevalence rates of 84% and 88% are found. This does not indicate that injecting drug use caused transmission of HIV or that anal sex was the cause of transmission of HCV, but that risky drug injection and sex practices were common to this group. Among HIV-positive men in developed countries whose primary HIV risk factor is sex with other men, published HCV rates are much lower (3.7–6.6%) (37). Despite availability of syringe and needle exchange programmes in major cities in Pakistan where IDUs are located, surveys showed drug users continued to reuse syringes (78.1%), injected in groups (73.3%) where extensive sharing of needle and injecting paraphernalia took place (50%), 12.6% of men reported having sexual relationships with female sex workers and 14.7% had sex with males in the past 6 months and 65% never used condoms (38).

In Australia to the end of 2005, over 225,000 diagnoses of hepatitis C virus (HCV) with an estimated prevalence in Australia has been recently reported at 2.3% with the virus. The 20-24 year old age group had the highest prevalence with a strong majority of the infected population below the age of 50. HCV prevalence in IDUs has ranged from 50% to 70% since the early 1970s. Notifications were reported to have increased rapidly to between 17,000 and 20,000 new HCV diagnoses annually during the period 1995 to 2001, but have since declined

to around 13,000 to 15,000 notifications in the period 2002 to 2005. In contrast to the low HIV prevalence, hepatitis C prevalence among people attending needle and syringe programs remained at high levels in the period 2003 – 2012. HCV prevalence dropped among males from 63% in 2008 to 52% in 2012 and among females from 61% in 2008 to 54% in 2012. The decline in hepatitis C prevalence was not explained by demographic or laboratory factors. Hepatitis C prevalence among people who inject drugs has remained stable from 2009 (32, 39).

Of all people living with HCV, 82.3% were estimated to have been exposed to HCV through injecting drug use, while 29,000 (10.9%) were estimated to be from countries of high HCV prevalence who migrated to Australia with HCV antibodies, and 18,000 (6.8%) were estimated to have been exposed to HCV through receipt of contaminated blood or blood products or through other exposure routes such as unsterile tattooing or mother-to-child transmission. Recent studies of incident HCV notifications since 1995 indicate that of those cases where the transmission route was determined, the proportion of incident HCV infections due to injecting drug use was even higher, at around 90% (1, 13, 36).

Research (14) has found within injection initiation cohorts, an increase in HCV prevalence over time, with prevalence appearing to reach saturation around 90%. The results showed little indication that the rates of increase had changed with more recent initiation cohorts. The findings suggest that there may have even been an increase in HCV incidence among new initiates to injecting over the decade. Further, while duration of injecting was most strongly associated with HCV, the study also found that self-reported history of needle and syringe sharing and imprisonment were independently associated with higher HCV prevalence regardless of duration of injecting, with the exception of IDUs who have 15 or more years

injecting experience. In this group, recent risk behaviour had no relationship to prevalence. In summary, the findings suggest a persistent HCV epidemic despite significant harm reduction efforts in Australia since the mid-1980s, with HCV incidence effectively constant in successive initiation cohorts and saturation levels occurring with persistent drug injecting (14).

They also found that HCV rates remained associated with a longer duration of injecting, older age, living in New South Wales, opiates as the last drug injected, imprisonment in the last year, female sex work, daily or more frequent injection, sharing needles and syringes in the last month, sex work, and survey participation in the period 2000–2004. The duration of injecting, followed by age, was most strongly associated with HCV prevalence (14).

The study concluded that despite widespread availability of NSPs throughout Australia there was little indication that transmission of HCV infection among more recent initiates to injecting changed between 1995 and 2004, appearing to reach saturation around 90% in the older cohorts. For those who had been injecting for 15 years or more, recent risk behaviour had no relationship to prevalence. Moreover, they conclude that "community-based NSPs alone are not sufficient to prevent HCV transmission among IDUs". Despite these findings and no reference to HIV rates among injecting initiation cohort they studied they stated that "NSPs have played a significant role in maintaining low HIV prevalence among IDUs in Australia to date" and recommend increases in HR strategies to reduce HCV and to maintain HIV at low rates among IUDs (14). The evidence, however, indicates that such statements are not justified.

Needle and Syringe Programs

Many research papers that aim to examine the effectiveness of these harm reduction (HR) strategies commence with the assumption that these strategies have been proven to be effective, where this evidence is almost entirely lacking. For example, papers on HCV transmission and HR strategies will often declare that HR programs including NSPs and OST are effective in preventing spread of HIV (14, 32) and the evidence was "consistent and compelling", sufficient to persuade many major scientific authorities and governments about the substantial benefits of these programs.

The researchers do concede that personal beliefs and values shape attitudes towards public health interventions to a greater extent than scientific evidence. Indeed the promotion of HR policies to prevent HIV and HCV transmission is a case in point as, not only is there no convincing evidence that these strategies have been effective, but the promotion of these strategies as being evidence-based has convinced large sections of the public to support them. For example the latest United Nations Office on Drugs and Crime (UNODC) (15) review of the status of HIV prevalence among IDUs indicated a reduction in number from 3 million to 1.6 million people. Instead of applauding this finding Harm Reduction International, while saying it "welcomes UNODC's commitment to improving the collection of global data on HIV and injecting drug use, including through increased collaboration with other UN agencies on this work" refused to accept the figures with the reasoning that: "The WDR [World Drug Report] presentation of the data also allows for the erroneous conclusion that current efforts have had significant success in reducing the HIV epidemic among people who inject drugs globally. This is far from an accurate reflection of the current state of harm reduction. It is at best misleading, and at worst has the potential to weaken advocacy for increased political, financial and programmatic commitment to harm reduction." There was

no attempt to provide better evidence as it did not exist by their own admission. In other words, they were prepared to reject the best evidence as it did not suit the HR agenda (43).

However, the evidence indicates that NSPs have had negligible effect on either HIV or HCV transmissions for quite different reasons: The pattern of HCV incidence in Australia shows a consistently increasing rate of HCV infections to a peak of 14,000 new HCV seroconversions in 1999. In other words despite the rapid increase in NSPs in Australia HCV rates increased. Surveys of IDUs using NSPs also found that HCV incidence declined in 2001 and 2002, followed by a plateau in 2004 and 2005. This decline coincides with the overall reduction in drug use following implementation of strongly enforced supply and demand strategies of the Australian 'Tough on Drugs' years. Moreover, the major factor impacting prevalence rates is number of years injecting drugs and HCV has been found to reach saturation levels in time despite the 3,000 NSPs and 30 million needles distributed each year in Australia. Despite availability of syringe and needle exchange programmes in some countries, surveys showed drug users continued to reuse syringes, they injected in groups where extensive sharing of needle and injecting paraphernalia took place, a large proportion of men reported having sexual relationships with female sex workers and having sex with males with up to 65% saying they never used condoms (38).

The surveys of NSPs attendees have consistently shown that HCV has continued to increase among IDUs despite HR programs in Australia that are the best funded and most widespread and reach a larger number of at risk IDUs than any other country. However, the most telling arguments that cast doubt on the effect of NSPs on HCV transmission were the reviews of all HCV and NSPs studies to date (16, 40, 41, 42). They found no randomised controlled studies. They found seven primary studies which reported positive findings, but which mainly

involved weaker designs. They found that the stronger study designs (cohort studies) showed mainly either no association or negative association between NSP and HCV transmission. They concluded that given an absence of clear statements from the core reviews, and inconsistent evidence from the primary studies they and previous reviewers had identified, the level of evidence was insufficient to demonstrate any benefit of NSPs in the transmission of HCV (16).

A review of the research as to the cost effectiveness in NSPs found no convincing evidence that needle exchange, played any significant role in the prevention of HIV and HCV. In the UK HCV was considered the most important infectious disease affecting IDUs, with approximately 40% of IDUs infected, while, in comparison, HIV prevalence rates are relatively low among IDU populations (2%). They conclude that while there was good evidence that NSPs reduce injection risk behaviours among IDUs, there is insufficient evidence from two systematic reviews to determine the impact of NSPs on HCV infection in IDUs (17).

The conclusion to be reasonably made is clear regarding injecting drug use and HIV. Prevalence of HIV among IUDs has remained low and stable over many years and contrasts the increasing HCV rates both in Australia and the UK. The evidence is that HIV is primarily transmitted by MSM having risky sexual encounters and through co-infection with other STDs and by unprotected sex associated with poverty and prostitution. HIV is highly unlikely to be transmitted by sharing needles or injecting equipment as it is far less viable than the HCV outside the host's body. In 2007, Guy and colleagues (44) reported that the most frequent route of HIV exposure was male-to-male sex, accounting for 70% of diagnoses. Heterosexual contact accounted for 18% of cases, with just over half of these people born in or having a

sexual partner from a high-prevalence country. Exposure by injecting drug use remained infrequent (17, 44).

They concluded that the number of HIV diagnoses had risen in the previous 7 years and there was a need for effective, innovative and evidence-based programs for HIV prevention, particularly among men having male-to-male sex. They did not mention NSPs as a preventative measure. Clearly needle exchanges have not had in any significant impact on infection rates and are not relevant to any future preventative strategies. Like HIV, injecting drug use is concentrated in poor urban environments, associated with crime, sex work and social disadvantage (25).

Accordingly, they concluded that attention needed to turn to other factors that do promote infection and the implementation of strategies that do work (44).

Opiate Substitution Treatment

Despite claims to the contrary methadone does not directly impact on HCV or HIV transmission other than being shown to reduce some risks such as reducing frequency heroin injection (45). In the case of HIV a very limited transmission is related to injecting drug use, meaning that any effect OST had on injecting behaviour would have had virtually no impact on HIV transmission rates. Moreover, injecting drug use among the populations most affected by HIV would favour amphetamines and therefore they would be unlikely to have been involved in OST programs (27).

Despite these programs being in operation since the early 1980s the rates of HCV infection have increased and reached saturation levels among OST clients. In fact HCV prevalence rates are higher among attendees of OST programs compared to non-attendees and needle

and injecting equipment sharing is no less than non-attendees. Methadone also showed no better outcomes for mortality or criminality compared to no treatment (45). These findings suggest that although methadone maintenance may reduce injection frequency, it may increase duration of drug injecting and it does not reduce other HCV and HIV-related risk behaviours above and beyond what can be accomplished through other educational and outreach interventions. Treatment facilities and outreach intervention programs should collaborate to provide a comprehensive approach to reducing HIV and HCV risk behaviours among drug injectors both in and out of drug treatment (46).

Evidence of the benefit of methadone in reducing HIV and HCV transmission is absent or at the very best, it may reduce risky behaviour in the short term among opiates addicts, it may reduce injecting of opiates in the short-term and hence it may reduce needle sharing although even these claims are questionable (16, 46, 47).

Supervised Injecting Facilities

Extensive evaluation of the effectiveness in harm reduction of supervised injecting facilities (SIF) has been carried in an attempt to justify the expenditure of public money on these HR strategies. The stated aim is to reduce IDU harm, including the transmission of blood-borne viruses. Most noteworthy are the reports relevant to the Insite facilities in Vancouver and the Kings Cross Medically Supervised Injection Centre. What is immediately apparent from these reports is that the number of injections occurring at each facility is only a small proportion of the total number of injections occurring within the immediately vicinity. In Vancouver, some 70% of the client group are from the area within 500m of the facility and only 5% of injectors used the facility. In other words 3.5% of local people actually use the SIF. In Sydney in 2001 only 106 injections were in the facility compared to an estimated

4000-6000 injections in the Kings Cross/Darlinghurst precincts. Not only would these facilities have a negligible impact on overdose deaths or HCV transmission despite the risk associated with drug injecting, given the low rates of HIV among IDUs (1.5%) it could have no impact on rates of HIV transmission (48, 49). The same conclusion could reasonably be made regarding the Vancouver SIF. In other words any reduction in mortality, HCV or HIV transmission must have been due to other unrelated factors.

Conclusion

The spread of infectious diseases are mostly associated with marginalised groups adopting behaviour that is at odds with mainstream convention in situations where the means not to do so is compromised by ignorance and poverty. This often leads to unsafe sexual and drug using behaviour due to attitudinal factors and lack of exposure or access to preventive measures (25, 27, 48, 49). This inability to change behaviour has been complicated by the idea that the transmission of HIV and HCV can be stopped without people having to cease injecting drugs and indulging in risky behaviour as exemplified by the failure of the injecting facilities in Vancouver or Sydney to make any difference. The existence of such facilities tends to perpetuate these attitudes due the false hype that surrounds them.

As with most chronic diseases lifestyle factors play a significant role and can be changed. Most chronic diseases involve changes in personal behaviour such as diet, exercise and nutrition. For example, Hep A involves changes in hygiene practices to contain infection rates. The difficulty of convincing people to take responsibility for their own behaviour and to make changes in their lifestyle to prevent disease is a problem faced by all communities, especially due to the marginalisation of the most at risk groups. The question arises as to the extent that these prevention and treatment strategies can be implemented and whether they

infringe on personal liberties and rights. Even more complicated is the issue of HIV and HCV prevention as this involves stigmatised and often illegal behaviour and relationships with others. As well as requiring individuals to make changes to protect their own health it also entails some responsibility toward those who can acquire the disease through their own and others deliberate and risky behaviour. The traditional emphasis on each person taking responsibility for protecting his or her own health has a tendency to reinforce HIV-related stigma, potentially alienating those persons from prevention and treatment. People infected with HCV also face similar stigmatisation, as hepatitis C infection is strongly associated with the illegal and socially stigmatised practice of injecting drug use (3). Not surprisingly, there is a grave reluctance to admit to homosexuality, prostitution or drug use. Consequently these groups, who often have high rates of STDs, HCV and HIV, and act as a bridge to the heterosexual and non-IDU community in the spread of these infectious diseases rarely seek access to health services or to preventive programs for fear of punishment (3, 22, 31). Often though, they do not change their behaviour as the messages they receive reinforce the notion that it is a matter of individual rights and to require change is an abuse of those rights (50).

Surveys of IUDs and other at risk groups in Australia clearly demonstrate that HIV is primarily transmitted through unsafe sexual activity and that injecting drug use has minimal if any impact on infection rates, while HCV is almost exclusively transmitted by unsafe drug injecting and that sexual contact has had very little, if any, impact on transmission rates. Furthermore, the reviews of the studies in NSPs and HCV and HIV showed that given an absence of clear statements and inconsistent evidence from the primary studies there was insufficient evidence to demonstrate any benefit of NSPs in the transmission of HCV and that the few studies on HIV showed that transmission was primarily due to risky sexual behaviour and no conclusions could be reached regarding the effectiveness of NSPs on HIV

transmission (16, 39, 44). Despite this, advocates for HR continue to claim that the evidence is "substantial" and that needle syringe programmes, methadone or buprenorphine treatment or heroin-assisted treatment are effective and cost-effective even when no evidence is cited (50).

Attention therefore needs to shift to other preventative strategies, including community education and to treatment. Despite the clear differences in the means of transmission HIV and HCV the factor that was common to both groups was persistent risky behaviour, hence resulting in cross infection that was found to be up to 80% among some groups. Accordingly, the message from health authorities was that: primary prevention of HIV and HCV infection should target reduction of transmission of the virus; for HCV prevention reduction in injecting drug use was the key as any reduction in risky behaviour has failed to stem the increase in prevalence; and, safe sex education and behavioural change (including abstinence), condom use and new treatments were the major factors in reducing the transmission of HIV (13, 32).

Prevention in healthcare settings should also take place by having better sterilization, safer injections and reducing opportunities for accidental exposures to contaminated blood. It was recommended that in developing countries, better screening for donors and blood screening was needed to reduce the number of contaminated transfusions (13).

Prevention should target those at risk of acquiring the viruses and should involve providing education, risk reduction counselling, HIV and HCV screening and substance abuse treatment. Prevention should also be based on trends that have seen differences in rates of HIV from state to state. For HCV, counselling should be focused on drug treatment (13),

while for HIV the focus of prevention should be on screening and education on safe sex practices (35, 44). In both cases those found to have viral infections need to be counselled to reduce the risk of HIV and HCV transmission to others. They should also be offered counselling on treatment, safe sex and drug use practises reducing alcohol usage and other STDs (13, 32).

In the final analysis the evidence shows that policies that focus on education to reduce risky behaviour are undoubtedly the most cost-effective means of reducing the risk of transmission of HIV and HCV (32). Moreover, policies that reduce supply and drive up prices of illicit drugs reduce demand and reduce overall drug use are most effective in reducing HCV infection both of drug users and the wider community. The evidence supports the proposition that long-term recovery can be the expected outcome of substance use disorder treatment. Research in the USA has shown that for every dollar spent on drug treatment, there is a return of \$4-7 in reduced theft, drug-related crime, and criminal justice costs and with healthcare included, the savings are a ratio of 12:1 (51). Policies that have been effective have been neglected while harm reduction policies driven by a political agenda and showing no demonstrable impact on HIV and HCV rates have been the main focus in the last 20 years or more (52, 53). In other words, the funds spent on harm reduction policies would be more effectively spent by adequately funding policies that prevent risky behaviour and treat drug addiction. Not only would it be more effective in reducing the incidence of HIV and HCV infection there would be many other substantial benefits for the community.

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Conflict of Interest Statement

I declare that I have no proprietary, financial, professional or other personal interest of any nature or kind in any product, service and/or company that could be construed as influencing the position presented in, or the review of, the manuscript entitled except for the following: NONE