European Union
Drug Prevention and Information Programme

Evidence of effectiveness of harm reduction measures in prisons

Systematic Review

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ACCESS to treatment and harm reduction for drug users in custody

Content

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Abbreviations

EMCDDA	European Monitoring Centre for Drugs and Drug Addiction
HAV	Hepatitis A Virus
HBV	Hepatitis B Virus
HCV	Hepatitis C Virus
HIV	Human Immunodeficiency Virus
IDU	Injecting Drug User
OST	Opioid Substitution Therapy
PDU	Problem Drug User
PNSP	Prison-based Needle and Syringe Programme
RCT	Randomised Controlled Trial
RNA	Ribonucleic acid (for diagnosis of an infection with HCV)
SVR	Sustained Virologic Response (indicator for effective antiviral treatment)
UNODC	United Nations Office of Drugs and Crime
WHO	World Health Organization

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1 Introduction

The systematic review on effectiveness of harm reduction measures in prisons is part of the broader European project on access to drug treatment and harm reduction for drug users in custody (for further details see: wwww.accessproject.eu).

Within the European project the Frankfurt University of Applied Sciences is responsible to carry out a research on the legislation, policy and practice concerning harm reduction services provided for problem drug users (PDUs) in European Prisons. The overall aim of the research activity is to develop and elaborate knowledge on harm reduction in prison, and its legislative and regulatory frameworks in Europe.

One part of the research is to prepare a systematic review of international literature on evidence for effective harm reduction measures provided in prison settings for those prisoners with a drug problem. For the review published studies on these topics have been identified through computerized searches of relevant databases and additional manual searches in scientific papers.

Reviews extracting the current knowledge from existing research on a specific health problem became increasingly important to stakeholders such as healthcare managers or policy makers. This is especially true in times of economic crisis when limited funds need to be allocated to interventions that demonstrate evidence. In this respect the review on evidence of effective harm reduction in prison settings is to encourage prison managers and prison health care services to reduce prisoners' exposure to communicable diseases, and to contribute fully to each prisoner's rehabilitation by providing effective services which are in line with human rights and medical ethics.

Background for promoting effective harm reductions measures is the considerable proportion of drug users among the prison population. According to data of the EMCDDA (2012), on 1st of September 2010 there were an estimated 635,000 inmates in prison in EU Member States. Studies among problem drug users in the community show that between one third and three quarters of different samples of drug users have ever been in prison. In nine European countries 20-40 % of the drug users ever used any type of drug while in prison (EMCDDA, 2012). In general, prisoners are at greater risk of becoming infected with HIV, HCV and tuberculosis than people outside. Further prisoners are disproportionally vulnerable to suffer from poor mental health and mortality such as suicide (EMCDDA, 2012; UNODC, 2012). For opioid users the period after release is associated with high mortality risks due to the risk of dying from drug overdose.

The EU Action Plan on Drugs (2009-2012) explicitly calls for the development and implementation of prevention, harm reduction and treatment services in prison that are equivalent to services outside prison (EMCDDA, 2012). The equity of health care services in prison to that available in the wider community has repeatedly demanded by a number of organisations (Geneva Declaration, 2012; WHO, 2003, 2005). Further the Madrid Recommendation of the WHO stated that the provision of appropriate services in prisons has

to take note of the "current facts and figures regarding communicable diseases such as HIV/AIDS, tuberculosis, hepatitis and sexually transmitted infections in prisons worldwide and the high rate of post-release mortality" (WHO, 2010). Policies and practices in prisons should reflect research evidence on effective health protection measures. This includes as well harm reduction measures that are found to be effective in prisons.

This report provides the results of the systematic literature review as to harm reduction measures which demonstrated to be effective for the target group of drug users in the criminal justice system.

2 Method

The systematic review addresses the following main healthcare question: For which types of harm reduction measures – ranging from detoxification, opioid substitution treatment (OST), naloxone provision, vaccination, treatment for infectious diseases and prison-based needle and syringe programmes (PNSP) – there is scientific evidence that these measures are effective to minimise health risks for problem drug users being in prison or other custodial settings.

With respect to the healthcare question major electronic databases (Medline, Embase, Psychinfo, Psyndex) have been searched for peer-reviewed publications and primary studies by using a systematic search algorithm. Included published literature had to meet the following criteria:

- Focus: prison settings and harm reduction measures (in title or abstract) and drug use
- Type of publication: evidence reports, meta-analyses, systematic reviews. RCTs, observational studies
- Evaluation of effectiveness either in terms of social or biological outcome measures or in reduction of health risks
- Time limit: 2002 – current
- Limit to humans
- English language.

The latest search was conducted on the OVID platform on February 10th, 2012, using the search algorithm described in table 1. As it is known the systematic search in electronic databases is excellent in identifying most of published literature relevant for the review topic. However, in order not to miss relevant literature the search has been extended to reference lists of publications which had been hand screened.

Table 1: Keywords used for systematic database searches and results

Steps	Keywords	Search results
1	(prison$ or detention or custodial or correctional or penitentiaries or penitentiary or pre-trial or remand or arrest house).ti.	24.588
2	prison$ or detention or custodial or correctional or penitentiaries or penitentiary or pre-trial or remand or arrest house).ab.	42.170
3	Combine 1 or 2	527.41
4	(harm reduction or harm minimisation or opioid substitution or opiate substitution or detoxification or naloxone or test$ or vaccination or antiviral treatment or antiviral therapy or antiretroviral treatment or antiretroviral therapy or post-exposure prophylaxis or condoms or bleach or tuberculosis or HCV or HIV or hepatitis or needle$ or syringe$).**ti.**	1.574.013
5	harm reduction or harm minimisation or opioid substitution or opiate substitution or detoxification or naloxone or test$ or vaccination or antiviral treatment or antiviral therapy or antiretroviral treatment or antiretroviral therapy or post-exposure prophylaxis or condoms or bleach or tuberculosis or HCV or HIV or hepatitis or needle$ or syringe$).**ab**.	5.150.144
6	Combine 4 or 5	5.828.160
7	Combine 3 and 6	11.118
8	(substance disorder$ or addiction or substance abuse or IDU or drug user$ or substance misuse$ or dependence).mp. [mp=ti, ab, tx, ct, sh, hw, tn, ot, dm, mf, dv, kw, nm, ps, rs, ui, tc, id, tm, ax, kp, fw, cw, ia]	623.534
9	(evidence or effect$ or evaluat$).mp. [mp=ti, ab, tx, ct, sh, hw, tn, ot, dm, mf, dv, kw, nm, ps, rs, ui, tc, id, tm, ax, kp, fw, cw, ia]	14.980.768
10	Combine 7 and 8 and 9	960
11	limit 10 to yr="2002 -Current"	634
12	limit 11 to human	586
13	remove duplicates from 12	372
14	Hand search to remove further duplicates from 13 (n=15)	357
15	Exclusion of ineligible literature from 14	42
16	Additional references from manual search in scientific papers	9
17	Included in systematic review (combine 15 and 16)	51

* The latest run of steps 1 to 14 was the 10.02.2012

Through the search in electronic databases 357 references were found. After reading the title and abstracts of these references, 314 papers were excluded as they did not meet the inclusion criteria (step 14 to 15 in the search strategy). In detail, the following number of references had been excluded:

- 115 references without evaluation of effectiveness
- 58 are epidemiologic articles
- 46 references were not about prison but community treatment
- 34 references are on a different target groups than problem drug users
- 29 references address mainly the risk behaviours of prisoners
- 33 refer to guidelines, unsystematic overviews, case reports, protocols or conference papers

After this procedure 42 references were identified through the systematic database search. Another nine publications were identified through hand searches of reference lists. Finally 51 publications are included in the present review.

The 51 eligible publications are assessed systematically as to their research content and their methodological quality. To assess the content all studies and reviews are entered in a database which includes the following criteria

- Authors, year, country; sample; design and methods; intervention details; outcome measures; main results and limitations.

The quality assessment is done according to the methodology checklist of the SIGN guidelines developer's handbook (SIGN, 2011). The respective checklist of SIGN is used for the assessment of the internal validity of RCTs, systematic reviews and meta-analyses, cohort studies and case-control studies (Annex C of the handbook). As regards the quality assessment of RCTs the checklist of SIGN has been adapted to the study designs in the field of drug research. Out of the 10 SIGN items of the RCT checklist two items were not used, and one further item has been added (for details see the Annex).

In order to determine the levels of evidence, also the evidence statements of SIGN are used (Annex B in the handbook). The level of evidence reflects the quality of the studies and reviews, and for the purpose of this study three of the classified five evidence levels are considered (table 2).

Table 2: Levels of evidence according to SIGN (2011)

Level	Criteria
1++	High quality meta-analyses, systematic reviews of RCTs, or RCTs with a very low risk of bias
1+	1+ Well conducted meta-analyses, systematic reviews, or RCTs with a low risk of bias 1 - Meta-analyses, systematic reviews, or RCTs with a high risk of bias 2++ High quality systematic reviews of case control or cohort studies, high quality case control or cohort studies with a very low risk of confounding or bias and a high probability that the relationship is causal
2+	Well conducted case control or cohort studies with a low risk of confounding or bias and a moderate probability that the relationship is causal
2-	Case-control or cohort studies with a high risk of confounding or bias and a significant risk that the relationship is not causal
3	Non-analytic studies, e.g. case reports, case series

3 Description of literature included in the review

The 51 publications eligible for the review differ widely in their research designs (table 3). However, most of the publications consist of observational studies including case control and cohort studies (31 %). Almost one quarter of the publications consists in either RCTs (24 %) or reviews and meta-analyses (25 %). The remaining studies are case register studies, analysis of cost effectiveness and process evaluations.

The majority of the literature is of US-origin (n=23). Second most often are publications from Europe, with most of them being from the United Kingdom (n=10). In the third place follow publications from Australia (n=7). There are also publications from Canada, Iran, Taiwan and those covering the area of the United Nations.

Table 3: Overview on study designs of literature included in this review

Study design	Number	Studies	Country/Region
Randomized controlled trial (RCT)	12	Howells, Allen et. al. 2002; Sheard, Wright et al. 2009 and 2011	UK
		Prendergast, Hall et al. 2003; Prendergast, Frisman et al. 2011; Kinlock, Gordon et al. 2007 and 2009; Gordon, Kinlock et al. 2008; Saber-Therani, Springer et al. 2012	USA
		Dolan, Shearer et al. 2003	Australia
		Berman, Lundberg et al. 2004	Sweden
		Asli, Moghadami et al. 2011	Iran
Reviews and meta-analyses	13	Dolan, Rutter et al. 2003; Larney 2010	Australia
		Mitchell, Wilson, et al. 2007; Tripodi, Blesoe et al. 2011; Cropsey, Villalobos et al. 2005	USA
		Perry, Coulton et al. 2009; Prison Drug Treatment Strategy Review Group 2010	UK
		Lines, Juergens et al. 2004; Lines, Juergens et al. 2005	Multisite
		Juergens 2007; Juergens, Ball et al. 2009	United Nations
		Stöver and Nelles 2003; Hedrich, Alves et al. 2012	Europe
Observational studies (incl. semi-experimental, controlled clinical trial, case-control, prospective cohort, cross-sectional)	16	Lubelczyk, Friedmann et al. 2002; Allen, Spaulding et al. 2003; Bauserman, Richardson et al. 2003; McGovern, Fiore et al. 2005; Braithwaite, Stephens et al. 2005; Heimer, Catania 2006; Messina, Burdon et al. 2006; Sacks, McKendrick et al. 2008; Chew, Allen et al. 2009; Joe, Rowan-Szal et al. 2010; Springer, Chen et al. 2010	USA
		Dolan, Bijl et al. 2004; Dolan, Shearer et al. 2005	Australia
		Ahmadvand, Sepehrmanesh et al. 2009	Iran
		Huang, Kuo et al. 2011	Taiwan
		Skipper, Guy et al. 2003	UK
Implementation studies	2	Gilbert, Connor et al. 2004; Perrett 2011	UK
Case register studies	4	Maru, Bruce et al. 2008; Rosen, Schoenbach et al. 2009	USA
		Farley, Vasdev et al. 2005	Canada
		Bate, Colman et al. 2010	Australia
Cost effectiveness	4	Sutton, Edmunds et al. 2006 and 2008	UK
		Tan, Joseph et al. 2008	USA
		Warren, Viney et al. 2006	Australia
Total	**51**		

The literature considered for this review covers a range of interventions aiming at reducing the demand for illicit drugs and preventing infectious diseases in the criminal justice system. Table 4 presents an overview of the interventions addressed in the 51 publications. Especially reviews and meta-analyses might comprise more than one intervention, so that multiple entries for one publication are possible.

Most of the literature addresses substitution treatment either in terms of opioid substitution maintenance treatment or detoxification. There are also a number of publications on effects of other types of drug treatment, which is usually abstinence-oriented treatment. As regards the issue of infectious diseases, a body of studies and reviews investigate the effectiveness of testing for HIV or HCV, treatment for infectious diseases or different kind of preventions measures such as vaccination. Only a few publications address the evidence for prison needle exchange programmes which might be due to the fact, that these programmes are still rare in prisons. Finally a couple of references is focussed on interventions which could neither be defined as drug treatment nor as prevention of infectious diseases. These interventions consist in - for example - case management offered to prisoners.

Table 4: Type of interventions addressed in studies and reviews (n=51) – multiple entries possible

Interventions addressed	Number of studies and reviews
Substitution treatment (detoxification and OST)	17
Therapeutic communities for drug treatment	5
Other type of drug treatment	7
Testing for HIV and treatment for HIV/AIDS	2
Vaccination for hepatitis, testing and treatment for HCV	13
Information and education on prevention of infectious diseases	5
Prison-based needle and syringe programmes	5
Other interventions (such as case management, enhancement)	2

The overall aim of harm reduction measures is to reduce the harm associated with the use of illicit drugs. Such measures include especially OST, testing for blood-borne viruses, treatment for infectious diseases, needle exchange programmes, and prevention strategies such as vaccination, provision of bleach and condoms. It has to be noticed that no literature could be identified investigating the effectiveness of the provision of condoms or preventive measures addressing risks due to unprotected sex or unsafe tattooing in prison.

4 Findings: Evidence for effective harm reduction in prison

In many countries, a substantial proportion of the male prisoners and in particular of the female prisoners is drug dependent or has used illicit drugs at some point in their life (EMCDDA, 2012; Fazel, Bains, & Doll, 2006). Due to the high number of drug users among the prison population, the European Union as well as the World Health Organization (WHO, 2007) and the United Nations Office on Drugs and Crime (UNODC, 2012) emphasised the need to implement evidence-based health interventions in prisons. The UNODC has defined 15 key interventions for HIV prevention, treatment and care in prisons and other closed settings (UNODC/ILO, 2012) These key interventions are regarded as a "comprehensive package" being essential to address the health care needs of prisoners.

The systematic review, which includes 51 papers on the effectiveness of interventions for prisoners, is structured in consideration of the comprehensive package. However, the literature eligible for this review does not cover all key interventions of this package. Indeed, no literature has been identified on the effectiveness of a) condom distribution, b) the prevention, diagnosis and treatment of tuberculosis, c) the prevention of sexual violence and d) the prevention of through tattooing, piercing and other forms of skin penetration. With regard to the interventions covered by the 51 studies included in this review, the evidence for effectiveness is indicated for each reference according to evidence levels specified by SIGN (see table 2).

4.1 Effectiveness of drug dependence treatment

The majority of the literature, which was eligible for this review, focuses on treatment offered to drug dependent prisoners during their imprisonment or after prison release. Accordingly there is a body of high quality studies on detoxification and opioid substitution treatment (n=17), on therapeutic communities for drug treatment (n=5), and on other type of drug treatment such as counselling (n=8).

4.1.1 Detoxification

On the effectiveness of detoxification in prison there are three RTCs, all from the United Kingdom. In an older study, the efficacy of lofexidine for opioid detoxification has been investigated in a double blind RCT among 80 male prisoners in one Southern England prison (Howells et al., 2002). After proof of being opioid dependent, the prisoners were randomized to 10-day detoxification with either lofexidine (n=32) or methadone (n=36). Both groups were similar in age and severity of dependence. During the study the patients as well as the healthcare team were kept blind of the medication. Effect size was measured with self-rating scales on severity of withdrawal symptoms, the patients completed daily. The results demonstrated no significant differences for the withdrawal scores between the two groups *(evidence: 1++)*. However, based on the small sample treatment retention was better for methadone compared to lofexidine (88 % vs. 69 %).

Another study evaluated with an open-label RTC design if detoxification with codeine or buprenorphine is more effective (Sheard et al., 2009). Male prisoners with a confirmed opiate addiction who were expected to be released from a Leeds remand prison in 28 days were eligible for detoxification with either daily sublingual tablet buprenorphine or daily oral tablet dihydrocodeine over a reduced regimen of no more than 20 days. A total of 90 opiate users were randomized to detoxification with buprenorphine (n=42) and codeine (n=48). Outcome measure was abstinence from illicit opiates indicated by urine test at one, three and six months post-detoxification. One major result was the high treatment drop-out rate of 30 %, and accordingly no more than 32 patients in the buprenorphine and 31 patients in the codeine group completed detoxification. At the three follow-up points there were no significant differences between the groups as regards urine samples negative for opiates *(evidence: 1-).* As 43 % of the participants continued to use opiates during detoxification, the authors concluded that opioid maintenance treatment would be more effective in prison settings. In his comprehensive review Juergens (2007) supported this conclusion. High rates of relapses to drug use after detoxification limit the effectiveness of withdrawal management and indicate that community maintenance treatment is often interrupted at prison entry.

A further open-label RCT was conducted in three prisons, two for male and one for female, in order to evaluate the effectiveness of detoxification with methadone and buprenorphine on opiate abstinence (Wright et al., 2011). 289 prisoners with confirmed opiate addiction and a remaining prison term of 28 days were included in the study, and data on follow-up was available for 113 patients in the methadone group and 100 patients in the buprenorphine group. Both groups were comparable as to age and opiate use patterns. Like in the previous study outcome measure was abstinence from illicit opiates indicated by urine tests at one, three and six months post-detoxification. At all follow-up points the analysis showed that there was equal clinical effectiveness between methadone and buprenorphine in achieving abstinence. The logistic regression revealed that the strongest predictor for abstinence was to have achieved abstinence at eight days post-detoxification. However, the authors reported less demand for detoxification due to the increased availability of maintenance treatment.

4.4.2 Opioid substitution maintenance therapy

The effectiveness of opioid substitution treatment was evaluated in eight original studies from different countries, and with various methods and a huge variation in sample selection and sample size. However, in all studies no other medication than methadone was investigated (table 5). Three of the studies were a consecutive follow-up of a three comparison group RCT conducted among male pre-release prisoners in Baltimore, United States (Gordon, Kinlock, Schwartz, & O'Grady, 2008; Kinlock, Gordon, Schwartz, Fitzgerald, & O'Grady, 2009; Kinlock et al., 2007). Two further studies were from Australia, with an initial RTC of methadone patients in prison, and a subsequent cohort study on long-term effects of methadone treatment (Kate Dolan et al., 2003; K. Dolan et al., 2005). Furthermore there was one cohort study from Taiwan on mortality of treated IDUs (Huang et al., 2011), one pilot evaluation of maintenance treatment in a Puerto Rico prison (Heimer et al., 2006), and a small-scale experimental study from Iran on effects of prison-based methadone on depressive symptoms (Ahmadvand, Sepehrmanesh, Sadat-Ghoreyshi, & Zahiroddin, 2009).

Table 5: Outcomes of opioid substitution maintenance therapy based on eight studies

Authors	Study design	Treatment sample	Medication	Main results
Dolan et al. (2003; 2005) Australia	RCT on 4-month outcome Cohort study on long-term impact (medium follow-up of 4 years)	RCT follow-up sample: 253 mostly male prisoners Cohort sample: 382 (total RCT sample)	Methadone in prison and after release (up to daily dose of 60 mg)	RCT results: significant decline in heroin use (hair analyses), drug injecting, syringe sharing (evidence: 1++) Cohort results: no mortality while in treatment Out of treatment mortality rate: 2.0 per 100 person-years Treatment retention reduces rates for mortality, re-imprisonment and HCV infection (evidence: 2+)
Kinlock et al. (2007; 2009); Gordon et al. (2008) USA	RCT on outcome at 1, 6 and 12-month post release	211 male prisoners in Baltimore; at 6-month follow-up: n=201 at 12-month follow-up: n=204	Methadone in prison and after release (up to daily dose of 80 mg)	Continued treatment resulted in: a) significantly reduced positive tests for opioid use b) reduced criminal activity (evidence: 1-)
Heimer et al. (2006) USA	Case control study to evaluate pilot in one prison in Puerto Rico	60 male prisoners (self-selected and randomly assigned)	Methadone in prison (daily dose of 80-120 mg)	Progress evaluation results: According to urine testing 95 % reduction in heroin use while in treatment (evidence: 2-)
Ahmadvand et al. (2009) Iran	Semi-experimental study on effect of methadone on depression	33 IDUs with diagnosed depression	Methadone in prison (daily dose 60-80 mg) for 3 month period	While in treatment 29 individuals (88 %) showed improvement on scores for depressive symptoms. No antidepressants were given (evidence: 3)
Huang et al (2011) Taiwan	Prospective cohort study until 18 months after release	4,357 IDUs after prison release; 88 % male	Methadone after release	Mortality rate after release was 2.4 and 1.5 for males and females per 100 person-years Lower mortality rate for continued treatment: 0.24 per 100 person-years (evidence: 2++) Overdose was main cause for mortality (34 %)

The effectiveness of methadone treatment on opiate use (urine test), cocaine use (urine test) and criminal activity (self-reported) was evaluated in a sample of male pre-release prisoners by means of three comparison groups (Kinlock et al., 2007). The first group received counselling only (n=64), the second group was actively transferred to methadone treatment upon release (n=66), and the third group was enrolled in methadone treatment in prison and after release (n=70). The 6- and 12-month follow up showed that initiation of methadone maintenance in prison and continued treatment retention is significantly more effective in reducing heroin use and criminal activities than counselling only (Gordon et al., 2008; Kinlock et al., 2009). At 12-month follow-up in 66 % of the counselling group the opioid test was positive compared to 25 % for those in continued methadone treatment. In comparison to counselling only continued treatment also had also a positive effect on cocaine use (73 % vs. 43 %). Results for criminal activity and re-imprisonment show no significant differences.

An Australian cohort study provide findings from a 4-year follow-up of prisoners who had been randomised to prison-based methadone maintenance or a waitlist control group (K. Dolan et al., 2005). Based on records for re-imprisonment the findings show that the risk of re-imprisonment was lowest during methadone maintenance treatment of at least eight months. From finger-prick blood sample it was found that an increased risk of hepatitis C seroconversion was significantly associated with prison sentences of less than two months [P =0.001)] and treatment episodes of less than five months [P =0.01)].

The cohort study from Taiwan demonstrated, after adjusting for covariates, that the mortality rate for those prisoners who continued methadone treatment in community was significantly lower that for those who were never enrolled in methadone treatment (0.2 vs. 2.6 per person-years). Mortality most often occurred in the first week after prison release, and was mainly due to drug overdose (Huang et al., 2011).

A number of low-quality reviews supported the findings that prison-based methadone maintenance treatment is effective in reducing the frequency of drug injecting and sharing of injecting equipment in prison (Cropsey, Villalobos, & St. Clair, 2005; Juergens, 2007), if a sufficient high dose of methadone (more than 60 mg per day) is provided and if the treatment duration is more than six months (Juergens, Ball, & Verster, 2009). A systematic review of five studies on OST provided in prison revealed (Larney, 2010): Compared to control groups for the treatment group the use of illicit opiates was reduced by 62-91 %, injecting drug use was reduced by 55-75 %, and the sharing of needles and syringes was reduced by 43-73 %. A direct effect of OST on HIV incidence was not supported with the review *(evidence 1+).* Similarly a recent systematic review of opioid maintenance treatment confirmed that prison-based treatment with an adequate dosage and duration is effective to reduce drug-related risk behaviour (Hedrich et al., 2012). There is limited evidence for the impact of pre-release maintenance treatment on further outcomes such as cocaine use in prison and post-release mortality. Evidence was equivocal as regards effectiveness on criminal behaviour and re-imprisonment, and insufficient for the treatment impact on HIV and HCV incidence *(evidence: 1-).*

Finally there is an Australian study on the cost-effectiveness of methadone treatment provided in prison (Warren et al., 2006). Prison methadone treatment was found to be cost-effective as

the treatment provides benefits for risk reduction and as the treatment costs are comparable to community treatment costs.

4.4.3 Therapeutic Community (TC)

The effectiveness of therapeutic communities offering drug treatment in prison has been predominately evaluated in the United States. TCs are intensive treatment programmes of 9 to 12 months, and based on a combination of behavioural therapy, individual and group counselling, and 12-step support. After prison release TC participants are usually offered aftercare.

This review included four studies on TC evaluation and one meta-analysis, which are all from the United States. Two of these studies were conducted in different prison settings in California (Messina, 2006; M. L. Prendergast, Hall, & Wexler, 2003), one study was conducted among male amphetamine users in 30 prisons in Texas (Joe, Rowan-Szal, Greener, Simpson, & Vance, 2010), and finally one study was carried out in a Denver prison for women (Sacks, 2008). Prendergast et al. (2003) evaluated the TC effectiveness at 12-month post-release in 531 male prisoners of the Amity prison, who were eligible for TC participation. Randomisation was made from the TC waiting list, and from this list 335 individuals were included in the treatment group and 196 individuals built the control group. Outcome was based on official records, self-reported drug use and drug testing result. Findings on 12-month post release showed that the treatment group performed significantly better than controls on re-imprisonment (50 % vs. 34 %), and survival time until re-imprisonment, days to first illegal activity, and days to first drug use *(evidence: 1+)*. Further, those who completed both prison-based treatment and community-based aftercare had significantly better outcomes than individuals who received lesser amounts of treatment. The second Californian study was a retrospective cohort study among 4,386 male and 4,164 female participants in 16 prison-based TCs (Messina, 2006). The aim of the 12-month post treatment evaluation was to explore gender differences in aftercare participation and re-imprisonment. At admission to treatment women compared to men had substantial disadvantages with regard to drug use history, co-occurring psychiatric disorders, and sexual and physical abuse prior to imprisonment. Results show that the treatment outcome for women was not affected by their disadvantages. For both men and women participation in aftercare was strongly associated with motivation for treatment and time spent in prison TC. Findings from logistic regression indicated that the strongest predictor for re-imprisonment was the total number of years in prison and the co-occurrence of psychiatric disorders *(evidence: 2+).*

With a control group design Sacks et al. (2008) evaluated a prison-based TC which was especially modified for female drug addicts with co-occurring severe mental health disorders. The control group received cognitive behavioural therapy (CBT) which was delivered according to a curriculum of a 90 hours course over the period of 15 days and additional mental health service. The six month post-prison interview was completed by 90 women of the TC group and 57 women of the CBT group. For outcome measure standard instruments on psychiatric diagnosis and psychological functioning has been used. Of the whole sample only 27 % has no Axis 1 diagnosis (n=40), while the majority of the women had at least one

diagnosis. Findings show that the modified TC treatment programme is an effective model for female prisoners with varied mental health diagnoses *(evidence: 2++).* For all mental health disorders TC treatment was significantly more effective for substance use, mental health and HIV sexual risk behaviour than the control condition.

Finally the process-related outcome on behavioural change and substance use was evaluated on basis of treatment records across three treatment conditions for 2,026 male methamphetamine users in 30 prison-based programmes in Texas (Joe et al., 2010). One treatment was based on group counselling (OPT; n=1,321), one condition was an intensive TC programme modified for heavy amphetamine users (TC1; n=450), and the third condition was a usual TC programme focussed on substance use (TC2; n=255). According to multilevel covariate analysis of the treatment records, significant improvements were found for all three treatment conditions. Thus, none of the treatments could be assessed as being the "best," and the effect sizes corresponding to these programme differences were generally in the small range *(evidence: 2-).* However, as treatment varied over the time of the research, the findings are of limited evidence.

In general, it remains unclear whether the effect of TC programmes can be attributed to the intensity, duration and modality of the TC or the combination of TC and aftercare or the higher treatment motivation of participants who were self-selecting into the programme. A meta-analysis of the effectiveness of TCs in reducing post-release offending and drug use consistently found (Mitchell, Wilson, & MacKenzie, 2007): TCs were effective in reducing re-offending and drug use after prison release, and this finding was robust to the methodological quality (experimental, RCT), sample (age, gender, offense), and programme features such as duration, newly introduced or established *(evidence 1++).*

4.4.4 Other drug treatment

Other types of drug treatment comprise a variety of different interventions such as relapse prevention (Springer, 2010), group counselling (Mitchell et al., 2007), drug-free units (Juergens, 2007; Juergens et al., 2009), Cognitive Behavioural Therapy (CBT) (Prison Drug Treatment Strategy Review Group, 2010; Tripodi, Bledsoe, Kim, & Bender, 2011), and auricular acupuncture (Berman, Lundberg, Krook, & Gyllenhammar, 2004).

The short-term impact of treatment with buprenorphine and naloxone on relapse prevention was evaluated in 23 HIV-infected opioid dependent prisoners, who were at least 18 years old and 90 days prior to their release (Mitchell et al., 2007). The primary outcome was retention in treatment, opiate craving and opioid-free urine testing over the period of 12 weeks. According to findings of weekly assessments retention in treatment was high as 74 % of the sample completed the 12-week treatment (n=17). Opioid craving was clearly reduced, adverse effects of the medication were few and mild, and negative opioid testing increased during treatment *(evidence: 2-).* Pre-release treatment with buprenorphine and naloxone is acceptable and feasible as relapse prevention, although evidence is limited due to the very small sample. Auricular acupuncture for reducing craving and alleviating symptoms of discomfort was evaluated with an RTC design among 158 male and female prisoners in Sweden (Berman et al., 2004). Participants were randomly assigned to two types of auricular acupuncture, the

NADA protocol acupuncture and the non-specific HELIX acupuncture. Treatment was delivered in 14 sessions over a four week period. Due to pain caused by acupuncture there was a high dropout-rate in both groups of 40-60 %. In both groups there was a considerable reduction in self-reported symptoms of physical and psychological discomfort *(evidence: 1-)*. However, due to the lack of an untreated comparison group and potential placebo effects, evidence for auricular acupuncture remains uncertain.

Group counselling, which integrates components such as education or 12-step treatment, has been evaluated in a meta-analysis of 25 studies (Mitchell et al., 2007). As effectiveness was evaluated with week methods and without a clear description of the treatment provided, Mitchell et al. (2007) concluded that evidence is unclear *(evidence: 1++)*. Limited evidence for drug-focused counselling was also reported by a review of reviews (Prison Drug Treatment Strategy Review Group, 2010).

Based on two comprehensive reviews evidence for effectiveness of drug-free units on reduction of drug use in prison is ambiguous (Juergens, 2007; Juergens et al., 2009). According to the review a small number of studies indicated that these units may assist prisoners in reducing their drug use, but the long-term effects are unknown *(evidence: 3)*.

In a systematic review evidence for drug treatment programmes incorporating Cognitive Behavioural Therapy (CBT) delivered to women prisoners was evaluated (Tripodi et al., 2011). Based on effect size calculations participation in CBT is effective in reducing post-release substance use in women *(evidence: 1++)*. The review of reviews considered the evidence base for different drug treatments in prisons (Prison Drug Treatment Strategy Review Group, 2010). The review found mixed evidence for CBT, a modest effect of 12-step treatment programmes on reduction of substance use, and an initial effect of Contingency Management (CM) in reducing cocaine use but this effect does not maintain over time. With regard to aftercare the review reported long-term effectiveness of aftercare in substantially reducing both acquisitive crimes and drug selling crimes *(evidence: 3)*.

4.2 Effectiveness of HIV testing and treatment for HIV /AIDS

According to the search criteria used for this review, respectively only one study have been identified on effectiveness for HIV testing (Rosen, 2009) and treatment for HIV/AIDS (Saber-Tehrani A.S. et al., 2012).

Rosen et al. (2009) conducted a study on rates of voluntary HIV testing uptake among adult male and female prisoners in eight state prisons in North Carolina. As part of the medical evaluation a nurse screens prisoners for conventional HIV risk behaviours, and voluntary HIV testing is available anytime during imprisonment either by request of the prisoner or by clinician recommendation. The evaluation of the testing rates is based on electronic records on inmates who entered prison between January 2004 and May 2006. A total of 54,016 prisoners entered prisons who were mostly male (86 %). Out of them 38 % were tested for HIV. Women were significantly more likely to get tested than men (86 % vs. 32 %). However, risk behaviour related to needle sharing and sex work was found to be more prevalent among the female prison population. The evaluation also looked at associations

between prisoners' characteristics and uptake of HIV testing. According to a covariate-adjusted analysis prisoners who had a history of heroin, crack or cocaine use, a conventional HIV risk behaviour or tuberculosis were at least 10 % more likely to be tested for HIV than prisoners without these characteristics The evidence based on one study indicates that HIV testing is well accepted and effective in female prisoners, while many male prisoners with documented risk of infection were never tested *(evidence: 2-)*. In general, the authors concluded that testing rates were higher when testing is easily available and offered privately. However, a major limitation of the findings lies in their depending on routinely collected administrative data.

The effectiveness of antiretroviral therapy (ART) was tested in a two-site RCT among HIV-infected adults who had been released from prison and returned to community to New Haven or Hartford, United States (Saber-Tehrani A.S. et al., 2012). The treatment group received antiretroviral therapy by trained community outreach workers who appointed the patients once per day at seven days per week and provided additional behavioural skills training during the last intervention month (DAART condition). The control group received monthly refills from the research pharmacy (SAT condition). All participants obtained pre-release support and 30 days post-release assistance. The Intent-To-Treat sample consisted of 154 men and women, with 103 individuals belonging to the treatment group and 52 individuals belonging to the control group. The treatment and control group were similar in their characteristics; 81 % were male, 61 % opioid dependent, and 54 % had an underlying depression. The primary outcome of the RCT was the viral suppression (viral load) at 6 months after initiating treatment. The 6-month outcome showed that the directly administered antiretroviral therapy (DAART) is superior to self-administered therapy (SAT) among released HIV infected prisoners *(evidence: 1-)*. Significantly more DAART than SAT participants had a virus load below 400 copies/mL (78.6 % vs. 52.9 %). However, DAART is a rather intensive intervention, and not needed for all HIV infected prisoners to support adherence to therapy.

A qualitative study from Canada on adherence to HIV treatment among HIV positive injecting drug users explored, that imprisonment as well as prison release is associated with the discontinuation of treatment for non-clinical reasons. Adherence to treatment was mainly hindered by difficulties to obtain the HIV medications (Small, 2009). Thus, coordination with community care is of particular importance to enhance treatment adherence in prison settings.

4.3 Effectiveness of vaccination, diagnosis and treatment of viral hepatitis

With regards to the effectiveness of hepatitis vaccination, solely two studies address this type of prevention; one study from Iran is an RCT on efficacy of vaccination against hepatitis B (Asli et al., 2011), and the other study is from the UK and assesses the effectiveness of a vaccination campaign in a prison in Doncaster (Gilbert et al., 2004). In both studies the sample consisted of male prisoners. Within the parallel-group RTC design, the efficacy of accelerated versus a classic HBV vaccination was investigated at one month and 8 months in a sample of 169 male prisoners who were not infected with HIV and hepatitis (Asli et al., 2011). Accelerated vaccination included four doses of HBV vaccine in a two month period,

while classic vaccination consisted in three doses over a 6 month period. Results show that compliance (full dose vaccination) was high in both groups, while an accelerated vaccination schedule achieved sero-protection more rapidly. However, eight months after the first vaccine the sero-protection rate was 78.8 % for accelerated and 93.4 % for classic vaccination *(evidence: 1-)*. Classic HBV vaccination provided statistically higher rates of sero-protection, but in case of short prison sentences accelerated vaccination is recommended as it achieves clinical significant immunisation. The UK study focused on the successful implementation of a hepatitis A vaccination campaign, conducted in an area affected by an HAV outbreak (Gilbert et al., 2004). The vaccination campaign was implemented for a four-week period, following a previous intensive promotion among the prisoners. During the campaign 91 % of the local prison population was vaccinated, with 52 % of them having injected drugs. In conclusion, a large number of prisoners could be vaccinated in a short period of time, providing an effective measure to interrupt outbreaks of viral hepatitis *(evidence: 3)*. The benefit of HBV vaccination offered in prison was also supported by a study modelling the HBV vaccination programme in prisons in England and Wales (Sutton, Gay, et al., 2006). According to the authors HBV vaccination in prisons is an effective way to vaccine hard-to-reach population such as IDUs.

There are two studies on effectiveness of diagnosis for viral hepatitis (Perrett, 2011; Skipper, Guy, Parkes, Roderick, & Rosenberg, 2003), and another two papers estimating the cost-effectiveness of HCV screening (Sutton, Edmunds, & Gill, 2006; Sutton, Edmunds, Sweeting, & Gill, 2008). All four studies have been rated as non-analytic studies, and thus they have a low evidence level (3). In an observational study Skipper et al. (2003) investigated the effectiveness of a prison outreach clinic for diagnosis of hepatitis C among male prisoners, who entered one of three local prisons in the UK in the period from 2000 to 2001. All new inmates were offered confidential HCV antibody testing at reception, and out of 1.618 prisoners only about 8 % accepted testing. Despite good quality counselling on HCV and confidential testing, the majority of the prison population did not ask for HCV testing. A similar result was reported by the Australian study of Perrett (2011). A nurse-led HCV testing programme offered testing to 4.500 prisoners entering a substance dependence unit at a local prison during a four-year period. Only 176 prisoners (4 %) accepted testing, demonstrating the need to encourage uptake of blood-borne virus testing in prisons. In a controlled trial conducted in England and Wales the researchers identified that it is not the testing procedures which contribute to an increase in HCV testing rates, but the greater priority to HCV testing at policy level (Hickman et al., 2008). However, a qualitative interview study explored as well personal barriers (lack of confidentiality and awareness for testing) and institutional concerns (lack of pro-active approaches, inadequate pre- and post-test discussion) which result in a low rate of HCV testing (Khaw, 2007). From an economic perspective, two modelling studies from the United Kingdom demonstrated that testing for HCV is cost-effective (Sutton, Edmunds, et al., 2006; Sutton et al., 2008). Both studies estimated the cost-effectiveness of HCV screening for current or former IDUs on reception into prison, compared to non-screening in prison. After calculating costs and benefits for a number of different case-finding scenarios, the results from the first study indicated that antibody and PCR tests administered to at-risk prisoners such as IDUs is more cost-effective than a non-screening practice (Sutton et al. 2006). In the later study the findings did not support that HCV screening in prison is

cost-effective in general (Sutton et al 2008). In fact, cost-effectiveness for HCV screening in prison is given if screening raises awareness for HCV and increases representation for screening in community. However, the different results for the cost estimations are due to the fact that the estimation models are based on different studies and related calculations of rates of individuals progressing to chronic HCV infection.

With regard to the treatment of chronic HCV infection, six studies have been identified examining the treatment effectiveness (Allen et al., 2003; Bate, 2010; Chew, Allen, Taylor, Rich, & Feller, 2009; Farley et al., 2005; Maru, Bruce, Basu, & Altice, 2008; McGovern et al., 2005), and a further study estimated the cost-effectiveness of standard HCV treatment (Tan, Joseph, & Saab, 2008). Four of the treatment effectiveness studies are from the United States, one study is from Australia and another one from Canada, with each being based upon a different study design and sample (table 6).

The treatment outcome, measured as 6 month post-treatment SVR, varies considerably between the studies from 13 % up to 66 %. The effectiveness of standard antiviral treatment for HCV delivered in prison settings was lower in the US-studies compared to the Canadian study. The reasons for the great variation in SVR rates remain unclear as the treatment completion rates are comparable in three studies (Maru et al. 2008; Allen et al. 2003; McGovern et al. 2005), and sample characteristics are similar in all studies. Almost all patients in the studies were male, more than half of them had a history of drug injecting, and about 40 % were diagnosed for a psychiatric disorder. The history of drug use or a psychiatric disorder was no contraindication for the antiviral treatment in prison settings. In addition, close monitoring of patients with co-occurring disorders and referral to drug treatment or psychiatric care during the treatment does not seem to have an impact on the effectiveness of HCV treatment. Further, Chew and colleagues (2009) found no differences in the SVR rate for those patients with previous HCV treatment. One unique outcome of studies is that the failure of SVR was significantly correlated with the genotype 1 HCV infection. However, the majority of 65-75 % of the patients in the studies was infected with genotype 1, except from the patients in the study of Farley et al. (2005), where treatment was in 48 % of the cases related to genotype 1. However, in general the findings of the studies are limited due to losses to follow-up and small treatment samples.

Table 6: Outcomes of HCV treatment based on five studies

Authors	Study design	Treatment sample	Treatment	Results
Chew et at. (2009) USA	Prospective cohort study at the Rhode Island prison, based on review of clinical charts	n=71 RNA-positive male patients: 68% with history of injecting n=33 completed treatment (46%)	According to standard guidelines with weight-based dosing of pegylated interferon-α2b and ribavirin	SVR at 6 months post-treatment: 28% Lower SVR for genotype 1 compared to genotypes 2 and 3 (18% vs. 60% and 50%) (evidence: 2+)
Maru et al. (2008) USA	Longitudinal case register study during 2002 to 2006 among 22.000 inmates in 20 correctional facilities in Connecticut	n=68 prisoners without previous antiviral treatment: 85% male, 68% with history of injecting n= 47 completed treatment (69%)	Pegylated interferon and ribavirin (PEG-RBV)	SVR at 6 months post-treatment: 47% Lower SVR for genotype 1 compared to genotypes 2 and 3 (43% vs. 59%) (evidence: 2+)
Allen et al. (2003) USA	Retrospective, observational study in 1997-2001 among n=394 HCV positive prisoners at Rhode Island	n=90 HCV positive, mostly male patients (96%): 88% with drug use history n=79 completed treatment (88%)	Interferon and ribavirin	SVR at 6 months post-treatment: 46% (evidence: 3)
McGovern et al. (2005) USA	Observational study during 1999-2002 in a Boston prison among n=164 HCV positive patients with an underlying HIV infection	n=46 mainly male patients with HCV and HIV infection n=37 treatment completers (80%)	Pegylated interferon-α2b and ribavirin according to guideline	SVR at 6 months post-treatment: 13% (evidence: 3)
Farley et al. (2005) Canada	Review of medical charts of 10 correctional facilities in British Columbia	n=80 male patients without use of illicit drugs in previous 6 months	Pegylated interferon-α2b and ribavirin according to standard guidelines	SVR at 6 months post-treatment: 66% Lower SVR for genotype 1 compared to genotypes 2 and 3 (47% vs. 100% and 77%) (evidence: 3)

An Australian retrospective cohort study among 74 male treatment completers evaluated the post-SVR outcome over a 12-year period (Bate et al. 2010). Six months after completion of standard HCV treatment - for mainly genotype 3 (51 %) - SVR was achieved for 72 % of the patients. 12 years after the end of treatment 17 % of the patients became re-infected with hepatitis C *(evidence: 2-)*.

In conclusion, HCV treatment in prison is feasible and outcomes acceptable, in particular in consideration of the high rate of morbidity among the patients (drug injecting, psychiatric disorder, HIV co-infection). The importance of prisons for the management of chronic HCV infection is supported by a study on cost-effectiveness (Tan et al., 2008). Based on the assumption that almost 80 % of the prisoners are infected with genotype 1, the cost-effectiveness of hepatitis C treatment with pegylated interferon and ribavirin was determined for the U.S. prison population via a decision analysis model. Even though there might be high re-infection rates and nonliver mortality rates, HCV treatment remained cost-effective in prisoners of nearly all age ranges and genotypes when liver biopsy was not a prerequisite to starting antiviral therapy. In patients between the ages of 40 and 49 with no fibrosis and genotype 1 infection, the treatment turned out to be not cost-effective.

4.4 Effectiveness of information, education and communication

Information, education and communication aim at raising the awareness of prisoners for risks related to HIV, sexually transmitted infections, viral hepatitis and tuberculosis. Four studies address these types of intervention.

Peer education as a group intervention was evaluated in an experimental case control study from the United States (Braithwaite, Stephens, Treadwell, Braithwaite, & Conerly, 2005). The aim of the study was to investigate the short-term effectiveness of peer education in reducing HIV-related risk behaviour and in reducing recidivism across four intervention conditions: 1. didactic presentation (DP) which consisted in health education on HIV and substance misuse through videos and communication; 2. peer education (PE1) which had the same conditions as DP plus additional role play, and was delivered by HIV negative imprisoned male peer educators; 3. the same condition as PE1, but peer education was delivered by HIV positive male peer educators (PE2); 4. traditional health promotion by video served as control condition (CC). Peer education was a 12-session curriculum-based intervention with two groups per week for a period of six weeks. A total of 116 adult male prisoners were randomized from four prisons in Georgia, with each prison delivering one condition. Short-term outcome of peer education on behavioural changes were measured by participant interviews at baseline prior to participation and at three months after prison release. Results show that, with exception of the control group, in all other groups a substantial reduction in substance use was reported. In addition, in the three groups self-efficacy related to correct and consequent condom use was improved. With regard to substance use peer education was significantly more effective than the other two groups *(evidence: 2-)*. However, the results are limited by potential response bias of the interviewees, and in particular, by different baseline characteristics between the groups. The prevalence and severity of drug use was not comparable between groups.

A further study on the effectiveness of a HIV peer education programme was conducted in a male colony for drug dependent prisoners in Siberia (K. A. Dolan, Bijl, M., White, B., 2004). Between 2000 and 2001 a team of the Médecins Sans Frontiers (MSF) implemented three HIV health education training sessions. Each training session lasted one week, and was focused on best ways to disseminate information on blood-borne viral infections, condom use and use of bleach for cleaning injection or tattooing equipment. In each training 15-20 prisoners participated, who were chosen by prison staff. The effectiveness of peer education programme was evaluated prior to the training and four months after the third training. Evaluation was based on questionnaires among 153 and 124 prisoners in 2000 and 2001. Both groups reported similar level of drug injecting history (95 %) and sexual activity in prison (10-12 %). Compared to respondents in 2000 the respondents in 2001 were significantly more likely to correctly identify both how HIV can be transmitted. Further, the prevalence of tattooing in prison decreased significantly between 2000 and 2001 (42 % vs. 19 %). However, almost no use of bleach was reported. In conclusion, peer education was effective in significantly improving the prisoners' knowledge of HIV transmission and prevention (*evidence: 3*).

There are two further studies evaluating the effectiveness of HIV prevention, which are both from the United States and based on secondary analyses of a prospective cohort study (Bauserman et al., 2003; Lubelczyk, Friedmann, Lemon, Stein, & Gerstein, 2002). Lubelczyk et al. (2002) re-analysed data collected from 1,223 adult HIV-negative male and female prisoners who participated in different types of drug treatment programmes. The impact of HIV prevention services was evaluated by a comprehensive risk assessment 12 months after discharge from treatment for four groups: two groups received HIV prevention services (77 % of the sample), but respectively one group was inside and outside prison at 12-month follow-up. The other two groups that were inside and outside prison at follow-up did not receive HIV prevention services. Sample characteristics (race, age, substances used) differed considerably among the four groups. At follow-up 56 % of the sample were out of prison. At follow-up the majority of the sample demonstrated health improvement related to needle-sharing, sexual partners and condom use (70 %). In 15 % there were no changes, and in the remaining 15 % risk behaviour increased. Control of covariates show that the reduction of HIV risk behaviour was significantly associated with having been out of prison (*evidence* 2-). However, the effectiveness of HIV prevention services is not determined as other factors such as drug treatment and age could have an effect on evaluation outcome.

In the study of Bauserman et al. (2003) the effectiveness of a skills building programme delivered by case management counsellors was evaluated for 529 male and female programme completers with available records on pre-and post-intervention data. The case management programme consisted in individual counselling combined with group educational sessions. Outcome was measured by a 52-item questionnaire on changes in HIV-related risk behaviour (self-efficacy to increase condom use, reduce injecting drug use). Among programme participants statistically significant changes were found in self-efficacy for condom use and injection drug use, and intentions to practice safer sex after prison release (evidence 2+). Due to the lack of a control group, the observed changes cannot be attributed to case management with certainty.

In conclusion, HIV prevention programmes delivered by peer educators or case management counsellors seem to have an impact in reducing risk behaviour related to drug injecting and sexual activity. However, results on effectiveness of HIV prevention programmes are ambiguous. A systematic review of three studies on HIV prevention came to similar results (Tripodi et al., 2011).

4.5 Effectiveness of prison-based needle and syringe programmes

Although prison-based needle and syringe programmes (PNSP) had been introduced in Switzerland, Germany, Spain, Moldova, Romania, Luxembourg, Kyrgyzstan, Tajikistan and Islamic Republic of Iran, there is limited research on the evidence for PNSP. Through systematic searches, five reviews have been identified on effectiveness of PNSP. All reviews are referring to the same evaluations available for this intervention, which is Switzerland, Germany and Spain (K. Dolan, Rutter, & Wodak, 2003; Juergens et al., 2009; Lines et al., 2004; Lines, Jurgens, Betteridge, & Stöver, 2005; Stöver & Nelles, 2003). As the reviews have not been conducted systematically, their evidence level is pretty poor (evidence: 3). However, in absence of more rigorous evaluations, evidence is based on results of evaluations in these three countries.

The aims of the evaluation were to assess the feasibility of prison-based needle and syringe programmes and their efficacy in reducing risk behaviour related to sharing of injecting equipment. The schemes for evaluation were different in data collection and duration. In Switzerland, PNSP does exist since 1992, and evaluations of pilots were conducted in the women's prison Hindelbank and the men's prison Realta. The 2-year evaluation of Hindelbank and the 1-year evaluation of Realta consisted in reviews of medical and prison records, interviews with staff and prisoner, and voluntary blood tests. In Hindelbank and Realta participated 137 and 234 prisoners respectively in the pilot. In Germany, pilot programmes were operated since 1996, and the pilots in the women's prison Vechta and in the mens's prison Lingen were evaluated over a 2-years period, using interviews with staff and prisoners and partly results of HIV and HCV testing. In Vechta 169 female prisoners and in Lingen 83 male prisoners participated in the pilot programme. Further German PNSPs have been evaluated in the Hamburg prisons Vierlande and Am Hasenberge, both for male prisoners, and in Hahnöfersand for women prisoners. In Berlin, a 2-year evaluation was conducted in the prisons Lichtenberg (female) and Lehrter Straße (male), using semi-structured interviews and testing for HIV, HBC and HCV. Finally in Spain, the prisons in Bilbao and Pamplona have been evaluated for a one year period since introduction of PNSP in 1997.

All evaluations of prison needle and syringe programmes have been favourable, and support feasibility and efficacy. Syringe distribution was not followed by an increase in drug use, injection drug use or the number of drug injectors (Stöver et al. 2003; Lines et al. 2005). PNSP has consistently shown to be effective in reducing syringe sharing, as sharing declined strongly. In the two German pilot evaluations sharing of syringes decreased to 11 % at month four of the study to zero percent after month eight of the study. In addition, in two prisons in Germany (Lingen and Vechta) and in the Hindelbank prison in Switzerland a significant

decrease in abscesses was observed (Dolan et al. 2003; Lines et al. 2004). Further, the evaluations show, that no serious unintended negative events, such as the use of needles as weapon or unsafe disposal of used syringes, were reported (Stover et al. 2003; Dolan et. al. 2003; Lines et al. 2004). In five prisons, blood testing was performed as part of the programme evaluation and no new cases of HIV, hepatitis B or hepatitis C transmission were reported (Stover et al. 2003; Lines et al. 2004).

The review of Juergens et al (2009) included 3 studies on the use of bleach for cleaning syringes in prison. As bleach has often shown to be used improperly, there is no evidence for this approach. Distribution of bleach is therefore only second-line strategy to needle and syringe programmes in prison settings.

In conclusion, scientific evaluations consistently demonstrated that PSNP is effective in reducing needle and syringe sharing. There is less evidence for prison-based needle and syringe programmes as regards their efficacy to prevent blood-borne viral infections (Juergens et al. 2009). However, PNSP has shown to be feasible in different prison settings. Even though the programme evaluations are limited as their populations were small, feasibility of PNSP had been demonstrated also in larger prisons such as in Moldova with a prison population of at least 1,000. In conclusion, prison-based needle and syringe programmes can effectively reduce harms associated with needle sharing in prisons, and can been implemented in small to large size prisons.

4.6 Effectiveness of case management

The effectiveness of case management was evaluated in a multi-site trial from the United States (Prendergast et al., 2011) and in a systematic review from the United Kingdom (Perry, 2009).

The effect of strengths-based case management provided during transition from prison to community was evaluated at 9-month post-release for male and female prisoners who participated in prison drug treatment and were three months prior to release (Prendergast et al., 2011). Eligible prisoners from four states were randomized to transitional case management (TCM: n= 347) and standard parole (SR: n=334). Transitional case management was initiated two month prior to release and continued for six month in community, and offered with decreasing frequency. Service and behavioural outcome relied on self-report of participants and urine testing for drug use. Findings show that there were no differences between the two groups in outcome. Both groups were similar in participation in community drug treatment (62-65 %), and in behavioural improvement. In the TCM and SR group drug use in the past 30 days declined from 82.5% and 84.1% to 29% and 26.8. Similar improvement were also reported for increase of condom use *(evidence: 1-).* However, for prisoners with drug problems case management was not superior to standard parole service. This result might influenced by the fact that all study participants had received drug treatment prior to their release.

Perry (2009) reviewed 24 RTCs for their effectiveness of interventions solely offered to drug using offenders in different criminal justice settings. Only a few studies evaluated the

effectiveness of assertive case management and other community-based programs. However, due to the paucity of information no clear evidence could be drawn from these studies. Community pre-trial release with drugs testing (4 studies) or intensive supervision (4 studies) were reported to have limited or no effectiveness when compared to routine parole and probation. A meta-analysis of effect sizes of seven community studies resulted in favour of routine parole and probation *(evidence 1++)*.

5 Summary of findings

In prisons harm reduction measures have been implemented since the early 1990s in order to respond to the risks of HIV and/or HCV transmissions via unprotected sex and the sharing of injecting equipment. Prisons are an important setting for health interventions, including drug treatment, prevention and treatment of HIV and HCV infection. Interventions delivered to drug-using offenders have two major aims, (i) the reduction of drug use and criminal behaviour and (ii) the reduction of viral infections related to risk behaviour. The period of imprisonment is regarded as a critical opportunity to provide adequate health care addressing drug users problems, mental health problems and risks for transmission of HIV and hepatitis C. In prisons there is the ability to more closely monitor adherence to treatment, to provide psychiatric care, to address side effects of treatment for viral infections, and to screen and test for risks of infections. Even though injecting in prison is less frequent than in the community, each episode of injecting has the potential to increase sharing of injecting equipment, and due to the rapid turnover of prison populations injecting partners can change often. Against this background it is of crucial importance to know which interventions provide evidence for health and cost effectiveness. When summarising the results of this systematic review, the evidence base for the different harm reduction interventions is as follows:

- Detoxification

Detoxification with methadone and buprenorphine are similar in their effectiveness to manage withdrawal symptoms in prisons (3 studies), but due to the high rate of continued opiate use after detoxification opioid maintenance treatment is recommended as first-line treatment.

- Opioid substitution maintenance treatment

All studies on prison-based opioid maintenance treatment (8 studies) and all reviews are unique in their finding that this treatment is highly effective in reducing heroin use, drug injecting and sharing of needles and syringes if the daily dose is sufficient (over 60 mg) and the treatment duration long enough (more than 6 months). The evidence for other outcomes such as cocaine use or the HIV/HCV incidence is insufficient. Further, research findings do not clearly support that an increased provision of maintenance treatment has an impact on reducing re-imprisonment and post-release mortality.

- Therapeutic Communities for prison drug treatment

Therapeutic communities (TCs) for drug dependent prisoners have consistently shown to be effective in reducing re-offending and relapsing to drug use in comparison to controls (4 studies). The high impact of TCs on successful community transition is closely related to the

intensity and duration of drug treatment in prison. A meta-analysis found evidence for effectiveness of TC programmes independently from the methodological quality, sample characteristics of the study and the specific programme characteristics.

- Other types of drug treatment

Drug-free wings or units may support prisoners in achieving abstinence, but it is unclear if this effect persists after release (2 reviews). Pre-release treatment with buprenorphine and naloxone is feasible as relapse prevention, although evidence is limited (one study). Further there is limited evidence for drug-use focused counselling (2 papers). Evidence of Cognitive Behavioural Therapy (CBT) in reducing post-release substance use is ambiguous (2 papers). One review concluded that aftercare provides long-term effectiveness in substantially reducing criminal behaviour.

- Testing for HIV and antiretroviral therapy

Voluntary testing has shown to be more effective in female than in male prisoners as testing uptake was significantly higher among women (86 % vs. 32 %). However, this finding is only based on one study from the United States. Adherence to and effectiveness of antiretroviral therapy among recently released prisoners is improved if medications were directly given on a daily basis by a trained outreach worker. More favourable outcomes for directly administered compared to self-administered therapy were found in one RCT.

- Vaccination, testing and treatment for HCV

Vaccination of prisoners is an effective measure to interrupt outbreaks of viral hepatitis, and large number of prisoners could be vaccinated in a short period of time (2 studies). Despite of comprehensive actions to motivate prisoners for testing, testing rates have shown to be rather low (2 studies). As screening and diagnosis was found to be cost-effective (2 papers), there is the need to encourage uptake of blood-borne virus testing in prisons. Treatment of HCV achieved acceptable SVR in drug dependent prisoners, and those with HIV-co-infection or co-occurring mental disorders (6 studies). All studies found that lower SVR was significantly correlated with the genotype 1 HCV infection. On the other hand cost-effectiveness was also demonstrated for treatment of genotype 1 (one paper). However, the expected prison term needs to be long enough for completion of HCV treatment (48 weeks), and this represents the main barrier to expand treatment in prison.

- Information, education and communication

There is not strong evidence for the effectiveness of peer education or peer training on decreasing substance use and reducing sexual-related HIV risk behaviour (2 studies).Psycho-educational programmes to prevent risks of blood borne virus transmission had little effect on injection risk behaviour and a limited and inconsistent impact on the reduction of sexual risk behaviour among drug users in prison (2 studies).

- Prison-based needle and syringe programmes

Based on five reviews there is clear evidence that prison-based needle and syringe programmes are effective in significantly reducing sharing of injecting equipment among

prisoners who inject drugs while in prison. Effectiveness has been demonstrated for different prison settings. Evidence for PNSP in reducing infectious diseases is limited.

- Case management for transition into community

There is no evidence for effectiveness of case management when compared to standard parole service in increasing participation in community treatment and decreasing post-release drug use (one study and one review).

6. Conclusion

In accordance with other reviews we also faced a number of factors that create difficulties in interpretation of the evidence for effectiveness. This does not only include the variety of methodological designs and related quality, but also the variety in samples and having a sufficient shared understanding of the definitions used by researchers to describe particular types of interventions. In this review it was attempted to reduce the risk of bias per study through providing an assessment of the quality and evidence level for more robust study designs such as RCTs, systematic reviews, meta-analyses, cohort and case control studies. Of the 51 studies and reviews included in the review

- 19 papers have the lowest evidence level 3 (37 %),
- 14 papers have rated as evidence level between 2- and 2++ (27 %),
- 11 papers have the evidence level 1- (22 %), and
- 7 papers were at highest evidence level of either 1+ or 1++ (14 %).

However, the variation in methodological quality can have a biasing effect resulting in understatement or in favour of reported treatment effects. Treatment effectiveness is often demonstrated in studies where either no control group is used or where the control group also received treatment. In addition, the treatment and control groups are not always comparable in their characteristics at baseline. Accordingly baseline differences between the groups and especially selection-bias in observational studies are sources of bias influencing the treatment outcome. Findings which include selection bias are difficult to interpret as it unclear if the observed outcome is related to the treatment effect or to the selection bias. On the other hand systematic reviews and meta-analyses of high methodological quality tend to exclusively or predominately include RCTs which might lead to under-valuing the effectiveness reported in studies with alternative methodologies. In general, differences in research methodology and the sample may account for the variability in outcome; for instance this review found a huge variety in the effectiveness of treatment for hepatitis C. For some interventions weak studies may systematically overestimate treatment effects, while for other interventions, such as for instance TC programmes, the methodological quality, the sample or treatment characteristics did not substantively affect effect sizes of the outcome.

Most common difficulties in interpreting the evidence are due to small sample sizes, losses to follow-up and limited duration of follow-up. In addition, most of study populations are male, and only few studies explored gender differences. In addition, in a number of studies the proportion of drug users among the study sample was not specified. Thus, the effectiveness of

the treatment might differ for male and females and for non-drug users and drug users. Furthermore, a common source of bias is associated with the outcome measures. Outcome for substance use and HIV-related risk behaviour often rely on self-reports rather than on testing. Data on re-imprisonment and criminal behaviour is based on self-reports or on routinely collected administrative data such as treatment or prison records. A number of studies used records to analyse effects mortality rates, rates of recidivism or even long-term treatment effects which means to rely on data collected by others than the researchers. However, to comprise the effectiveness of harm reduction interventions in prison settings, it was useful to include a broader range of research to consider all available evidence.

Limitations of this review mainly arise from two factors, the methodological heterogeneity of the studies reviewed and the different number of studies available for the interventions considered for this review. Consequently an assessment of the evidence according to the same scheme was not possible, especially as some interventions are covered by more than eight studies while others are based on solely one study. To compensate this weakness a greater emphasis was given to research with more robust designs and higher quality scores. Despite these efforts the major limitation is the over-representation of literature from the United States and other countries outside Europe. Results from international research may not necessarily translate to Europe.

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Annex: Adapted checklist for the quality assessment of RCTs

	Study criterion			Rating (0-3)
1.1	The study addresses an appropriate and clearly focused question.	Well covered ③ Adequately addressed ② Poorly addressed ①	Not addressed ⓪ Not reported ⓪	
1.2	The assignment of subjects to treatment groups is randomised.	Well covered ③ Adequately addressed ② Poorly addressed ①	Not addressed ⓪ Not reported ⓪	
1.3	Subjects and investigators are kept 'blind' about treatment allocation.	Well covered ③ Adequately addressed ② Poorly addressed ①	Not addressed ⓪ Not reported ⓪	
1.4	The treatment and control groups are similar at the start of the trial. If not, any differences were controlled for in subsequent analysis.	Well covered ③ Adequately addressed ② Poorly addressed ①	Not addressed ⓪ Not reported ⓪	
1.5	The only difference between groups is the treatment under investigation.	Well covered ③ Adequately addressed ② Poorly addressed ①	Not addressed ⓪ Not reported ⓪	
1.6	All relevant outcomes are measured in a standard, valid and reliable way.	Well covered ③ Adequately addressed ② Poorly addressed ①	Not addressed ⓪ Not reported ⓪	
1.7	Dropouts were described in detail, including group allocation and time of dropout (before or after randomisation, baseline / follow-up assessments).	Well covered ③ Adequately addressed ② Poorly addressed ①	Not addressed ⓪ Not reported ⓪	
1.8	All the subjects are analysed in the groups to which they were randomly allocated (often referred to as intention to treat analysis).	Well covered ③ Adequately addressed ② Poorly addressed ①	Not addressed ⓪ Not reported ⓪	3
1.9	Where the study is carried out at more than one site, results are comparable for all sites.	Well covered / Not applicable ③ Adequately addressed ② Poorly addressed ①	Not addressed ⓪ Not reported ⓪	