UK Health Security Agency

Interventions to reduce infection-related harms for people who inject drugs in prisons and places of detention

A rapid review

Contents

Main messages

1. This review (search up to 25 May 2023) identifies and summarises evidence on the effectiveness of interventions to reduce infection related harms for people who inject drugs in prisons and places of detention, in total,16 studies were included (1 to 16). Infection related harms included direct harms, such as infections and abscesses, as well as behaviours that increased the risk of infection related harms, such as injecting drug use and needle sharing.
2. Opioid substitution treatment (OST) was assessed in 9 studies (1 to 9). Results were mixed both in terms of effects on injecting drug use, and hepatitis C virus (HCV) infection incidence. One RCT suggested participants who received OST had reduced injecting drug use, needle syringe sharing and HCV incidence (1). The results from observational studies which looked at the association between OST and reducing infection related harms (HCV incidence) or harmful behaviours (injecting drug use or needle sharing) were not consistent between studies (2 to 9). In all studies the incidence of HCV was low and therefore the ability to detect associations between OST use and HCV infection is limited.
3. Three studies reported on the effectiveness of needle exchange programmes on reducing needle sharing behaviours and infections (10 to 12). All 3 studies reported a decrease in needle sharing after implementation of needle exchange programmes, but the low incidence of blood borne virus infection makes it difficult to draw inferences about the association between needle exchange programmes and reducing the risk of infections.
4. Two studies reported on the impact of education programmes (13, 14). One RCT reported that people who received an acquired immunodeficiency syndrome (AIDS) education programme had similar frequency of injecting drug use and increased needle sharing behaviours, but better use of clean drug paraphernalia, compared to people who did not receive the education programme (13). The second study reported a reduction in tattooing practices as well as an increase in cleaning of injecting equipment after implementation of a peer-led education programme on HIV and blood borne viruses in prisons (14).
5. The included studies primarily reported on reduction of harmful behaviours, and the evidence for the impact on HCV incidence was limited and inconsistent.
6. Most studies were observational (13 out of 16). Evidence from these studies can imply an association between an intervention and outcome, but it was not possible to infer causality from these. In addition, some studies looked at the association between interventions and outcomes, which provided relevant information for this question, but these studies are not designed to assess the effectiveness of interventions. All studies were rated as low or medium quality using the quality criteria checklist, which may indicate that the included studies are at a higher risk of bias.

Purpose

The purpose of this review was to identify and summarise evidence relating to the effectiveness of interventions to reduce infection related harms for people who inject drugs (PWID) in prisons and places detention.

Methods

There was one review question:

1. What are the effective interventions to reduce infection related harms for people who inject drugs in prisons and places of detention?

This rapid review was conducted following streamlined systematic review methodologies to accelerate the review process. A protocol was produced before the literature search was conducted, including the review question, the eligibility criteria, and all other methods. Briefly, the population, interventions, context, and outcomes (PICO) terms for this review were:

- population: people who inject drugs or share needles
- interventions: any interventions that reduce infection related harms (including, but not limited to, needle exchange programmes, opioid substitution treatment [OST], and education programmes)
- context: prisons and places of detention (adult and juvenile), as well as immigration removal centres
- outcomes: infection related harms (including, but not limited to, abscesses, infections, and death).

Full details on the methodology are provided in the protocol in Annexe A.

One protocol clarification to note is that harmful behaviours, such as injecting drug use, needle sharing, or unsafe tattooing practices, were considered as relevant outcomes of interest for the review, as they could lead to infection related harms.

A literature search was undertaken to look for review level evidence, published (or available as preprint) up to 31 March 2023. Eight reviews were identified from this search, which provided a source of primary studies up to October 2020 (17 to 24). A search for primary studies was also conducted to identify relevant evidence published between 01 January 2020 and 25 May 2023 to overlap with the last date of searches in the included reviews.

A scoping summary was also conducted before the literature search (see Annexe A). The original intention was to summarise the findings of the reviews identified in this scoping summary as the main source of evidence for this question, supplemented by primary studies

identified from the new search between 01 January 2020 and 25 May 2023. However, when inspecting the reviews to include, it was agreed that they did not provide sufficient detail to answer the review questions and were all rated as critically low using the AMSTAR 2 criteria (25), see limitations in Table C.1. Therefore, the review methods were amended to using the reviews as a source of primary evidence, rather than relying on the reviews themselves as evidence. Four of the reviews did not include any primary studies that met the inclusion criteria for this review, and so were not used further in this report (26 to 29).

Screening on title and abstract was undertaken in duplicate by 2 reviewers for 20% of the eligible studies, with the remainder completed by one reviewer. Screening on full text was undertaken by one reviewer and checked by a second. Data extraction was performed by one reviewer and checked by a second.

Risk of bias assessment was conducted independently by 2 reviewers using the Quality Criteria Checklist (QCC) (30), with disagreements resolved by discussion with a third reviewer. The QCC also classifies study designs according to a hierarchy of their ability to identify causal relations between exposure and outcome:

- class A: randomised and quasi-randomised controlled trials
- class B: cohort studies
- class C: non-randomised controlled or crossover trial, case-control, time series, diagnostic, validity, or reliability studies
- class D: non-controlled trial, case study or case series, other descriptive study, cross-sectional study, trend study, before and after study

Evidence

Sixteen studies met the inclusion criteria (1 to 16), with all 16 primary studies (1 to 16) identified from the 8 reviews (17 to 24). No studies were identified from the additional search for primary studies published between 01 June 2020 and 25 May 2023 (7,828 primary studies were screened at title and abstract, and 39 were screened at full text).

Table C.2 details the characteristics of the 16 included studies. Studies excluded during full text screening are available, with exclusion reasons, in Annexe B. Results of the risk of bias assessment can be found in Annexe D.

There were 2 randomised controlled trials (RCTs) (1, 13) and one quasi-RCT (16), see Table C.2a, and 13 observational studies (2 to 12, 14, 15), see Table C.2b.

The following interventions to reduce infection related harms in PWID were included:

- opioid substitution treatment (OST) (1 to 9)
- needle exchange programmes (10 to 12)
- education programmes (13, 14)
- interventions with multiple components (15, 16)
- cleaning of injecting equipment (9)

The following outcomes were reported by these studies:

- injecting drug use (1, 3, 4, 6 to 16)
- hepatitis B virus (HBV) (11, 12, 15)
- hepatitis C virus (HCV) (1, 2, 5, 6, 8, 9, 11, 12, 15)
- human immunodeficiency virus (HIV) (1, 3, 10 to 12, 14)

These studies also reported on harmful behaviours:

- sharing needles or other drug paraphernalia (1, 3, 10 to 16)
- cleaning, sterilising needles or use of new drug paraphernalia for injecting drug use (13, 14) or prison tattooing practices (8, 14)

Note that cleaning injecting paraphernalia was both an intervention (looking at the associations between cleaning injecting equipment and HCV) and an outcome (looking at how education programmes affected cleaning of injecting paraphernalia).

Opioid substitution treatment (OST)

Nine studies included analysis of OST (methadone or buprenorphine) to reduce infection related harms in people who inject drugs, conducted between 1992 and 2020 (1 to 9). One study was an RCT (1), 3 were prospective cohort studies (2, 8, 9), 3 were retrospective cohort studies (3, 5, 6), and 2 were cross-sectional studies (4,7). One was conducted in Scotland (7), 6 were conducted in Australia (1 to 3, 8, 9) and 2 were conducted in Spain (5, 6).

Within these studies, the different terminology used to refer to OST included:

- methadone treatment
- methadone maintenance treatment
- opioid agonist therapy
- opioid maintenance treatment

Randomised controlled trial (RCT)

Dolan and others conducted an RCT (QCC rating: medium) of 253 male prisoners (mean age: 27 years, standard deviation [SD]: 6 years) in Australia between 1997 and 1998 (1). The prisoners were either allocated to methadone treatment or were placed on a 4-month waiting list to receive methadone treatment, with 4 months of follow-up of each group. The outcomes measured were injecting drug use behaviours and HCV or HIV infections. Injecting drug use was measured by hair sample analysis, HCV and HIV incidence by finger prick blood tests and interviews were conducted on self-reported injecting drug use and syringe sharing.

No incidences of HIV were reported during the study. The incidence of HCV was higher in participants on the waiting list for methadone treatment (incidence rate: 31.7 per participant year, 95% CI: 9 to 81 per participant year) compared to those receiving methadone treatment (incidence rate: 24.3 per participant year, 95% CI: 7 to 62 per participant year, p value for comparison > 0.05) however the number of HCV incidences was very low in each group (4 per group). Injecting drug use decreased in those receiving methadone treatment between baseline and 4 month follow-up (64% to 34%), whilst an increase in injecting drug use was seen in the waiting list group (70% to 76%, p value for comparison of injecting drug use in the treatment group compared to the waiting list group < 0.001). Likewise, syringe sharing also decreased in the treated group (53% to 20%) whereas there was an increase in the waiting list group (45% to 54%, p value for comparison < 0.001).

Observational studies

Prospective cohort studies

Cunningham and others (QCC rating: medium) conducted a prospective cohort study between 2005 and 2014 looking at factors associated with HCV infection in 320 prisoners in Australia (72% male, median age: 26 years); this included OST (prescribed methadone or buprenorphine) (9). Structured interviews assessed receipt of OST, and HCV infection was assessed by blood tests (mean follow-up time: 2.3 years, range: 1 to 4.1 years). OST was not associated with time to HCV infection (hazards ratio (HR): 1.27, 95% CI: 0.74 to 2.2, p=0.39) however, only 49 people reported current OST treatment and this study was not designed to assess the effectiveness of OST.

Dolan and others (QCC rating: medium) followed up 365 prisoners who had been recruited as part of the RCT discussed above (1) for 4 years between 1998 to 2002 in Australia (2). Records of 82 participants receiving methadone maintenance treatment in prison and 146 not receiving methadone maintenance treatment were analysed for HCV and HIV incidence. The study suggested that the rate of HCV infection was highest in participants with the shortest time spent in methadone maintenance treatment (less than 46 days in treatment: 127 per 100 person years, more than 377 days in treatment: 8 per 100 person years), although the number of infections in each group was low (less than 46 days in treatment: 2 infections, more than 377 days in treatment: 4 infections). In a multivariable regression analysis comparing treatment to

no treatment, there was no clear association between the time spent in methadone maintenance treatment and HCV infection:

- less than 46 days: HR = 1.6 (95% CI: 0.3 to 9.7, p=0.6)
- between 47 to 146 days: HR = 4.2 (95% CI: 1.4 to 12.6, p=0.01)
- between 147 to 376 days: HR = 1.1 (95% CI: 0.4 to 3.3, p=0.8)
- more than 377 days: HR = 0.4 (95% CI: 0.1 to 1.2, p=0.09)

It is important to note that 93% of prisoners followed up for the full length of the study were released at some point since the original RCT study, and although 78% were reincarcerated on a median of 3 occasions for sentences of about 6 months each time, the time prisoners spent in the community may introduce unknown confounding variables that could have impacted the findings of this study. The study also does not clearly report which participants were followed up for the complete period or lost to follow-up.

Teutsch and others (QCC rating: low) followed up 488 prisoners (65% male, mean age: 28 years, standard deviation [SD]: 6.9 years) with a history of injecting drug use and a documented negative HCV test within the last 12 months, between September 2005 and May 2009 in Australia (follow-up time not stated) (8). Participants were interviewed about risk-taking behaviours associated with HCV transmission, including injecting drug use, tattooing in prison and body piercing in prison. There were 94 cases of HCV diagnosed during the study period (incidence rate per 100 person years: 31.6).

Participants receiving methadone maintenance treatment had a higher HCV incidence rate (60.1 per 100 person years, 95% CI: 42.1 to 83.2) than participants not receiving methadone maintenance treatment (24.6 per 100 person years, 95% CI: 18.6 to 31.7, rate ratio: 2.5, 95% CI: 1.6 to 3.7, p<0.001). The authors suggest this association may be related to abuse of the dispensed methadone maintenance treatment or related to differences in the lifetime pattern of injecting methadone: approximately half of the inmates receiving methadone maintenance treatment reported a lifetime pattern of injecting methadone, compared to approximately a third of those not receiving methadone maintenance treatment. This study also reported on injecting drug use behaviours in prisoners and whether they were receiving methadone maintenance treatment.

The study stated that prisoners receiving methadone maintenance treatment (31 out 99 prisoners, 31%) reported a decreasing pattern of injecting drug use compared to controls, (77 out 391 prisoners, 20%, p=0.01). However, this finding was selectively reported in the main publication, with further relevant outcomes found in the supplementary material that did not support reduced injecting drug use behaviours in prisoners receiving methadone maintenance treatment:

- there were more self-reported incidences of injection of any drug since imprisonment in prisoners receiving methadone maintenance treatment (35 incidences out of 99 prisoners, 35%) compared to those not receiving treatment (98 out of 391 prisoners, 25%, p=0.04)
- there was no difference in self-reported incidences of injected illicit methadone or buprenorphine in prisoners receiving methadone maintenance treatment (14 incidences out of 99 prisoners, 14%) compared to those not receiving treatment (59 out of 391 prisoners, 15%, p=0.81)

Retrospective cohort studies

Dolan and others (QCC rating: medium) retrospectively analysed 187 participants (90% male) recruited in 1993 who injected drugs and had been in prison in Australia in the previous 2 years (3). Three groups were analysed:

- group 1 received drug addiction counselling
- group 2 received time limited methadone
- group 3 received methadone treatment for the duration of their imprisonment (continued methadone)

Participants in each group were interviewed about HIV risk-taking behaviours. The group receiving continued methadone reported reduced heroin injecting (15% continued to inject heroin) compared to both the group receiving counselling only (38% continued to inject heroin, p value for comparison with the continued methadone group <0.01) and those receiving time-limited methadone (50% continued to inject heroin, p value for comparison with the continued methadone group <0.001). Similarly, syringe sharing was reported to be lower by those receiving continued methadone (21%) compared to those receiving counselling only (39%, p value for comparison with the continued methadone group <0.05) and those receiving time limited methadone treatment (47%, p value for comparison with the continued methadone group <0.05).

Marco and others (QCC rating: medium) retrospectively analysed 119 prisoners (98% male, mean age: 33.4 years, SD: 6.3 years) who had responded to HCV treatment (measured by achieving sustained virological response 12 weeks post-treatment) from 4 prisons between January 2003 to June 2010 in Spain (5). Of the total cohort, 96 (81%) had a history of injecting drug use. Every 12 months after achieving sustained virological response, participants were re-tested for HCV, and interviewed about their injecting drug use, and whether they had remained on methadone maintenance treatment (mean follow-up: 1.4 years, SD: 0.3 years). Clinical records were also reviewed for these outcomes, and participant demographics. Of the 96 injecting drug users, 47 (49%) received methadone maintenance treatment for the entire duration of the study period (from treatment onset to evaluation in 2010). Participants who continued to receive methadone maintenance treatment for the entire duration of the study had lower HCV re-infection (1.64 per 100 person years) compared to those not receiving methadone (7.49 per 100 person years), but the difference in HCV re-infections was not statistically significant (p = 0.25). Other relevant outcomes such as injecting drug use and tattooing

practices were not stratified by whether prisoners were receiving methadone maintenance treatment or not and are therefore not reported here.

Marco and others (QCC rating: medium) reported a separate study retrospectively analysing 2,377 prisoners (60% white, mean age: 39.7 years, SD: 11 years, gender not reported) from one prison in Spain between 1992 to 2012 (6). This included 168 participants (7%) with a history of injecting drug use (mean follow-up: 4.22 years). Repeated serological analysis was conducted to identify risk factors associated with HCV. Participants with a history of injecting drug use who were receiving methadone maintenance treatment had a lower incidence rate of HCV (1.35 per 100 person years) compared to participants not receiving methadone maintenance treatment (6.66 per 100 person years), but there was no clear association for this comparison (HR = 1.07, 95% CI: 0.33 to 3.46, p=0.91). However, there was a low incidence of HCV infections in the study (3 infections in injecting drug users receiving methadone maintenance treatment).

Cross-sectional studies

Kinner and others (QCC rating: low) conducted a cross-sectional survey of 1,241 prisoners who injected drugs (78% male, age not reported) between August 2008 and July 2010, which compared outcomes from 2 approaches to OST provision in 2 prisons in Australia (4). The OST provided was mainly methadone, but buprenorphine was provided in some cases (exact numbers not provided). The first prison (Queensland) did not offer OST for men but did offer OST for pregnant women or women incarcerated for less than 12 months. The second prison (New South Wales) offered OST for all men and women. The study reported similar prevalence of in-prison injecting drug use among those with a lifetime history of injecting drug use (39% in Queensland, 42% in New South Wales p=0.27). However, the differences between the demographics of the prisons and how the intervention was implemented reduces the ability to draw conclusions from the comparison of these 2 groups.

Taylor and others (QCC rating: medium) conducted a cross-sectional survey of 5,076 prisoners (95% male, mean age: 32.4 years, SD: 10.9 years) in 14 prisons in Scotland between June 2010 and March 2011 (7). In 1,166 prisoners who reported a history of injecting drug use and were receiving OST in prison or had received OST in the previous 6 months, 98 (8%) reported continued injecting drug use. In the 368 prisoners with a history of injecting drug use who were not receiving OST in prison and had not received it in the previous 6 months, 24 (7%) reported continued injecting drug use (OR [odds ratio] = 1.32, 95% CI: 0.83 to 2.09). Therefore, the study found no clear difference in prisoners who reported continued drug use after receiving OST compared to not receiving OST. However, the study did not adjust for possible confounding variables which may have affected the outcome regardless of the intervention, injecting drug use was self-reported and there were some discrepancies in the number of participants reported receiving OST that were not explained.

Opioid substitution treatment (OST) summary

Results from the available evidence were mixed in terms of effect or association with injecting drug use and HCV incidence. OST (methadone or buprenorphine) was reported to be associated with reduced injecting drug use and needle syringe sharing in prisons by an RCT (1), and one observational study (3). However, 2 studies found no clear difference in injecting drug use in participants receiving OST (4, 7). One study selectively reported that more prisoners on OST reported decreasing injecting drug use patterns, but in the supplementary information this study reported conflicting results depending on the measure of injecting drug use, including that since imprisonment injecting drug use was higher in participants receiving OST and (8).

The results for HCV incidence from observational studies was also inconsistent. One RCT suggested receiving OST was associated with reduced HCV incidence (1). One study suggested that the incidence of HCV infection was highest in participants with the shortest time spent in methadone maintenance treatment (less than 46 days in treatment), but the association did not remain when adjusted for time-dependent variables in multivariable regression (2). Three studies suggested no strong association between OST and HCV infection (5, 6, 9), and one study suggested that participants receiving OST had a higher incidence of HCV compared to those who did not (8).

No studies reported on the effect of OST on reducing HIV incidence.

Needle exchange programmes

Three studies included analysis of needle exchange programmes to reduce infection related harms in people who inject drugs, all conducted between 1998 and 2009 (10 to 12). Two studies were conducted in Germany (11, 12), and one was conducted in Spain (10). One was a prospective cohort study (12), one was cross-sectional (10) and one was mixed methods (11).

Prospective cohort study

Stark and others (QCC rating: low) followed up 166 prisoners with a history of drug use (median age: 31 years, IQR: 27 to 34 years) in one male-only and one female-only prison in Germany from October 1998 to June 2001 (12). In the female-only prison, at the beginning of the study automatic syringe dispensing machines were installed in places not visible to prison staff. In the male only prison, social workers confidentially distributed needles and syringes 3 times a week in a dedicated room. Interviews about injecting drug use and syringe sharing were conducted and blood tests for HBV, HCV, and HIV were taken at baseline and every 4 months (median follow-up: 12 months). Four incident cases of HCV were reported between baseline and 12 month follow-up (however, only one case was confirmed to have been acquired in prison). Injecting drug use was reported to have decreased from 91% at baseline (men and women combined) to 67% for women at 12 months follow-up, but stayed similar for men (90% at 12 month follow-up). However, the study did not report results for men and women separately at

baseline, therefore it is difficult to make inferences about the association between needle exchange programmes and injecting drug use. Reported incidence of syringe sharing decreased from 71% to 11% at first follow-up (after 4 months) and 2% at second follow-up (after 8 months) from the combined results from both prisons, with no cases of syringe sharing reported at third and further follow-up (at 12 months).

Mixed methods study

Heinemann and others conducted a mixed methods study of the impact of a needle exchange programme, by installing needle syringe vending machines between April 1996 and July 1997 in one mixed-sex prison Germany (11). The QCC assessment was not performed for this study as the full text was not available in English, although one review reported the study as low quality (31). All extracted data was taken from the reviews that referenced it (20, 21, 31). This was a cross-sectional study of 213 prisoners (191 prisoners completed the questionnaire and 22 prisoners were interviewed) and longitudinal study with surveys of 231 male and female prisoners, age not stated.

Before implementation of the needle exchange programme, outcomes from 128 participants (injecting drug use, syringe sharing, HBV, HCV, and HIV infections) were compared to the same outcomes after implementation of the needle exchange programme through surveys (191 participants), interviews (22 participants), collection of blood samples (231 participants) and review of all participant's clinical records. Participants reported a minimal decrease or unchanged frequency of needle sharing after implementation of the needle exchange programme. No new hepatitis infections and one new HIV infection was reported after implementation of the needle exchange programme. Increased illicit drug consumption was reported in participants receiving methadone after implementation of the needle exchange programme (specific numbers not provided), but it was not specified if this was injecting drug use or other types of drug consumption. The findings of this study should be interpreted with caution as the baseline group (128 prisoners), does not constitute the whole study population at follow-up (191 prisoners), and the reviews reporting on this study did not provide an explanation for this increase in participant numbers.

Cross-sectional survey

Ferrer-Castro and others (QCC rating: low) quantitatively analysed results from cross-sectional surveys and interviews of male prisoners (less than 25 years old: 6%, 25 to 45 years old: 74%, more than 45 years: 20%) between 1999 and 2009 in Spain (10) The prisoners had all participated in a needle exchange programme and the survey asked about injecting drug use behaviours. The numbers of prisoners who participated in the surveys and interviews at each time point was unclear. HCV and HIV prevalence was also assessed through clinical records (362 records available for analysis at baseline and 425 records available for analysis at 10 year follow-up). Incidence of self-reported injecting drug use was higher at baseline (25%) compared to 10 years follow-up (9.1%). HCV and HIV prevalence also decreased from baseline to 10

years follow-up (HCV: 40% to 26%, p<0.01, HIV: 21% to 8.5%, p<0.01). The authors suggested that sharing needles decreased from baseline to 6 and 12 month follow-up (p<0.01) however the data supporting this finding was not provided. The findings of this study should be interpreted with caution as they are based on self-reported outcomes from unvalidated surveys. No consideration was given to confounding variables, and there was unclear reporting of the number of participants who completed interviews and surveys at each time point.

Needle exchange programmes summary

There was limited evidence of the effectiveness of needle exchange programmes for reducing infection related harms in people who inject drugs in prisons. One study reported only 4 HCV incident cases and no incident cases of HBV or HIV (12), one study reported no incident cases of HBV, HCV or HIV after implementation of the needle syringe programme (11), and one study only looked at prevalence at different time points after the study started, but found HCV and HIV prevalence decreased over time (10). As the incidence of HCV, HBV and HIV infections was low in these studies, it is difficult to draw inferences from the association between needle syringe programmes and reduction of infection related harms in people who inject drugs in prisons. All studies reported a decrease in needle syringe sharing from baseline to follow-up.

Education programmes

Two studies looked at the impact of education programmes to reduce infection related harms in people who inject drugs in prisons or places of detention. One was an RCT conducted in the US (13), and one was a cross-sectional study conducted in Russia (14).

Baxter and others (QCC rating: low) conducted an RCT on the effect of an AIDS education programme in 134 prisoners who reported injecting drug use (70% female, 67% white, 22% aged less than 26 years, 74% 26 to 40 years, 5% aged more than 41 years) in the US (study time period not reported) (13). Participants in the intervention group completed an 8-hour HIV and AIDS education programme, this was compared to a control group who did not participate in the AIDS education programme. The methods for randomisation or blinding during measurement of outcomes were not reported. In both the intervention and control group, a questionnaire about injecting drug behaviours was completed at baseline (the AIDS Initial Questionnaire) and again at 6 months post initial assessment (the AIDS follow-up Questionnaire). The questionnaire assessed needle-sharing behaviours using 3 numerical scales: shared items (range 0-20), cleanliness of drug works (range 0-40), and injection frequency in the last 6 months (range 1-64).

For each of these, a lower score indicated a lower risk of contracting HIV. The education group had a higher risk score from their needle sharing behaviours than the control group (education group mean score: 17.3, control group mean score: 15.8, p=0.05), but a lower risk from behaviours related to use of clean drug paraphernalia (treated mean score: 15.8, control mean score: 18, p>0.05). There were very similar risk scores from frequency of injecting drug use in

each group (education group mean score: 26.2, control mean score: 26.3, p>0.05). However, the results of this study may have been influenced by limitations of the study, including selection bias (majority of the participants were women partly due to a higher willingness to participate), the method of randomisation was not reported, and the measurement of the outcome was self-reported from an unvalidated questionnaire.

Dolan and others (QCC rating: low) looked at the impact of 3 week-long HIV and other blood borne virus peer educational sessions (including training on cleaning of injecting equipment and the risks of prison tattooing practices) conducted between the year 2000 and 2001 in Russia (14). In each session 15 to 20 prisoners (exact numbers not provided) were chosen to be trained as peer educators by prison staff, with the intention that they could then educate and train other prisoners. Four of the 10 prison cell blocks were randomly selected and prisoners within them invited to participate in the 2 questionnaires (153 prisoners in July 2000 and 124 between July to September 2001, 4 months after the third peer training session) on cleaning of injecting equipment and prevalence of tattooing practices. The study does not report if the prisoners who participated in each questionnaire were the same or different prisoners. Four months after implementation of the third and final peer training session, an increase was seen in the percentage of participants who self-reported cleaning injecting equipment, both before sharing injecting equipment with someone else (year 2000 survey = 56%, year 2001 survey = 62%) and before receiving injecting equipment from someone else (year 2000 survey = 61%, year 2001 survey = 89%). Self-reported tattooing decreased after implementation of the third peer training session (year 2000 survey = 42%, year 2001 survey = 19%, p=0.003), and a higher percentage of participants reported using a new needle 4 months after implementation of the third peer training session (year 2000 survey = 23%, year 2001 survey = 50%) or using an old needle but cleaning it (year 2000 survey = 16%, year 2001 survey = 50%).

Education programme summary

The 2 studies on education programmes suggested that they resulted in improved use of clean drug paraphernalia and reduced incidence of tattooing practices, however one study reported that risk from needle sharing behaviours was higher in the education group and there was a similar frequency of injecting drug use (13, 14). These studies had several limitations (both rated as low by the QCC), including selection bias and self-reported outcomes using unvalidated questionnaires, which mean the results should be interpreted with caution.

Interventions with multiple components

Two studies looked at other interventions including interventions with multiple components (15, 16). One study was a quasi-RCT which looked at the effects of OST and cognitive behavioural therapy in Iran (16), and one mixed methods study reported on the use of syringe dispensers combined with an educational and psychosocial intervention conducted between 1994 and 1995 in Switzerland (15).

Bayanzadeh and others conducted a quasi-RCT (QCC rating: not determined, as full text not available) of 120 male prisoners (mean age: 35.7 years) in Iran (time period of study not stated) (16). Limited information was available for this study as it was not possible to source the unpublished full text, therefore data was extracted from the reviews that included it (18, 19, 23). The prisoners were allocated to either receive opioid maintenance treatment (methadone) and cognitive behavioural therapy, or to a control group which received unspecified non-methadone addiction treatment, with 6 months of follow-up. Multiple consecutive surveys measured self-reported injecting drug use and needle syringe sharing. Lower risk of injecting drug use was reported in the treatment group compared to the control group (11% of participants receiving opioid maintenance treatment and cognitive behavioural therapy compared to 42% of controls receiving unspecified non-methadone addiction treatment, relative risk [RR] = 0.25, 95% CI: 0.09 to 0.69). A decrease was also reported in needle and syringe sharing when participants received opioid maintenance treatment (8% of participants on opioid maintenance treatment and receiving cognitive behavioural therapy compared to 29% of controls receiving unspecified non-methadone addiction treatment, RR = 0.27, 95% CI: 0.08 to 0.92). As the full text was not available, risk of bias could not be assessed, although the reviews that referenced this study highlighted several limitations which may have introduced bias or impacted upon the quality of the study, including:

- baseline data was not available to assess the possibility of selection bias
- it was unclear whether an ethical review was performed
- the study used a poor method of participant randomisation (participants were numbered and allocated to intervention group by odd or even numbers) which could have resulted in selection bias
- there was no clear method of handling any differential attrition between the treated and control groups (52% drop out in control group compared to 63% drop out in treated group)
- participants in the control group may have received treatment during follow-up

Nelles and others (QCC rating: low) conducted a mixed methods study of the impact of automatic syringe exchange dispensers as well as education and psychosocial interventions (lectures, group sessions and sociomedical counselling) on risks of injecting drug use and syringe sharing in female prisoners (age not reported) between 1994 and 1995 in Switzerland (15). Interviews were conducted (137 prisoners were interviewed at least once) and prison files reviewed to assess injecting drug use and syringe sharing, with blood samples taken to assess HBV, HCV and HIV prevalence at baseline (n=65), 3 months (n=49), 6 months (n=33), and 12 months (n=57). No new cases of HBV, HCV or HIV were identified after implementation of the syringe dispensers, education and psychosocial interventions. The number of prisoners who self-reported incidences of injecting drug use decreased from baseline (19 incidences, 29% of all participants interviewed at baseline), to follow-up (3 months: 18 incidences [37%, of participants interviewed at 3 months], 6 months: 11 incidences [33% of participants interviewed at 6 months], 12 months: 9 incidences [16% of participants interviewed at 12 months]. Self-reported syringe sharing also decreased from baseline (8 incidences, 8% of participants

interviewed at baseline) to follow-up (3 months = 5 incidences [10%], 6 months = 2 incidences [6%], 12 months: one incidence [2%]).

Interventions with multiple components summary

A combination of OST and cognitive behaviour therapy was associated with a lower incidence of injecting drug use and needle syringe sharing (16).

A combination of automatic syringe exchange dispensers and education, as well as psychosocial interventions, was found to reduce injecting drug use as well as needle syringe sharing, and there was no new cases of HBV, HCV or HIV reported (15).

The limitations of these studies were consistent with studies of other interventions, including a risk of selection bias (specifically, the studies did not provide enough information to assess if selection bias occurred), use of self-reported outcomes and a risk of bias introduced by withdrawals.

Other interventions

Cunningham and others (QCC rating: medium), conducted a prospective cohort study, reported above in section of the report on OST that also looked at use of bleach or other disinfectants to clean injecting equipment in 320 prisoners between 2005 and 2014 in Australia (9). Use of bleach was not associated with reduced time to HCV infection (unadjusted HR: 0.83, 95% CI: 0.43 to 1.61, p=0.59).

Health inequalities

This review focuses on people with drug dependence (specifically those who inject drugs) in prison settings who are a critically vulnerable population and an inclusion health group. Injecting drug use and imprisonment are significant risk factors for poor health outcomes and these groups are at higher risk of acute and chronic disease, mental health issues and reduced life expectancy.

Drug dependence and imprisonment often co-occur with compounding health issues typically set against a backdrop of entrenched socio-economic disadvantage.

This review specifically assesses interventions targeted to address infection-related outcomes which these groups are more at risk of and therefore contributes to improving the evidence base which may reduce health inequalities in this population.

Limitations

The evidence sources in this review included databases of published and preprint articles. An extensive search of other sources, such as grey literature, was not conducted. As with all reviews, the evidence identified may be subject to publication bias, whereby null or negative results are less likely to have been published by the authors.

This review was also conducted following streamlined methodology, with included studies limited to those published in English language. As a result, relevant studies or information within studies may have been missed.

Primary studies were sourced from previously identified reviews (see Annexe A), as well as a search for additional primary studies published from 2020. The previously identified reviews were rated as critically low using the AMSTAR-2 checklist (25) for several reasons, such as insufficient detail on included studies and no discussion of how methodological quality of the studies was assessed. In this rapid review, data extraction and quality assessment was directly from the primary studies, except for 2 studies for which the full text could not be directly read and assessed, therefore data could only be extracted from the reviews which cited these studies (11, 16). The reviews often did not provide a comprehensive search strategy or review protocol, which may have impacted on this review, as poor search strategies or limited inclusion criteria could have resulted in relevant studies being missed.

Most studies were observational (with the exception of 2 RCTs and one quasi RCT), with varying approaches to accounting for confounding variables. These studies can show an association between implementation of an intervention (such as OST) and a reduction in infection related harms (such as injecting drug use), but not necessarily that the intervention independently leads to a decrease in the harm.

All studies were rated as low or medium quality using the QCC, which may indicate that the included studies are at a higher risk of bias, and we were not able to directly read and therefore quality assess 2 studies (16, 31). Study limitations included selection bias, no adjustment for possible confounding variables which may impact the study outcome regardless of the intervention (such as age, sex or some measure of social deprivation), no detail provided on withdrawals or the demographics of participants lost to follow-up, use of self-reported outcomes, (particularly for injecting drug use and needle syringe sharing, which may have resulted in recall or social desirability bias) and use of unvalidated questionnaires to measure outcomes.

Additionally, several of the included studies were not designed to assess the aim of this review question, the effect of interventions in reducing infection related harms in people who inject drugs in prisons. Therefore, some of the extracted findings were from association studies, secondary analyses or stratified results with smaller participant numbers than the overall study.

Evidence gaps

Although there were several studies that reported on the effects of OST to reduce infection related harms in people who inject drugs in prisons, there were not many studies that provided evidence on the other interventions of interest (needle exchange programmes, education programmes and interventions with multiple components). This review reports mainly on reduction of harmful behaviours (injecting drug use and needle syringe sharing), as well as limited evidence on HCV infection, but information on other outcomes of interest were not reported on, such as abscesses, bacterial infections, septic arthritis, skin infections, or death.

Conclusion

Overall, the evidence for the effectiveness of OST in reducing infection related harms was inconsistent. The evidence for the effectiveness of other interventions was limited, such as needle exchange programmes, education programmes, and interventions with multiple components. The quality of evidence on needle exchange programmes was particularly low, though all studies reported a decrease in needle syringe sharing. The evidence for education programmes suggested they may reduce needle sharing and tattooing practices but may have no impact on injecting drug use. The use of disinfection of injecting equipment with bleach was not strongly associated with HCV infection. Limited evidence on a combination of automatic syringe exchange dispensers and education, as well as psychosocial interventions, suggested they may be associated with reduced syringe sharing and injecting drug use.

All studies were rated as medium or low quality, almost all studies were observational, and many studies did not account for confounding variables which have impacted outcomes regardless of the intervention or used self-reported outcome measures. This means that evidence from these studies may not represent the true effect of interventions to reduce infection related harms for people who inject drugs in prisons and places of detention.

Acknowledgment

We would like to thank colleagues within the Clinical and Public Health Response division who either reviewed or input into aspects of this review.

Disclaimer

UKHSA's rapid reviews aim to provide the best available evidence to decision makers in a timely and accessible way, based on published peer-reviewed scientific papers, unpublished reports and papers on preprint servers. Please note that the reviews:

- use accelerated methods and may not be representative of the whole body of evidence publicly available
- have undergone an internal, but not independent, peer review
- are only valid as of the date stated on the review

In the event that this review is shared externally, please note additionally, to the greatest extent possible under any applicable law, that UKHSA accepts no liability for any claim, loss or damage arising out of, or connected with the use of, this review by the recipient or any third party including that arising or resulting from any reliance placed on, or any conclusions drawn from, the review.

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Annexe A. Protocol

Review question

There is one review question:

1. What are the effective interventions to reduce infection related harms for people who inject drugs in prisons and places of detention?

A scoping summary of review level evidence answering this review question was previously produced, which identified 12 relevant systematic reviews (17 to 24, 26 to 29).

As these reviews provide evidence for a range of interventions (opioid substitution treatment, psychosocial and educational programmes, needle syringe exchange programmes, and multi-component interventions), an evidence summary will be produced describing the results of these reviews. For opioid substitution treatment and needle syringe exchange programmes, the included reviews searched up to June 2020, and for psychosocial and educational programmes, the included reviews searched up to May 2021.

To update the evidence, a rapid review will also be conducted, with a search for primary studies from 1 January 2020 up to 25 May 2023.

Eligibility criteria

	Included	Excluded
Population	• people who inject drugs • people who share needles (for example, tattooing)	Animals
Settings	• prisons and places of detention (adult and juvenile) • immigration removal centres	Settings not in prisons and places of detention
Context	All contexts	
Intervention or exposure	Any intervention which reduces infection related harms, including (but not limited to): • bleach tablets • blood borne virus testing • needle syringe programmes • opioid substitution or maintenance treatment • pre-exposure prophylaxis • psychosocial or education harm reduction programmes • wound care or cleaning	Interventions unrelated to harm reduction
Outcomes	• abscesses • bacterial infections, including MRSA, botulism, tetanus, anthrax, subacute bacterial endocarditis • blood-borne viruses, including hepatitis C, HIV, hepatitis B • septic arthritis • cellulitis or skin infections • death	Re-addiction to injectable drugs
Language	English	Studies written in languages other than English
Date of publication	1 January 2020 to 25 May 2023	

	Included	Excluded
Study design	• controlled trials (including randomised controlled trials, cross-over trials, and quasi-experimental studies, amongst others) • observational studies (including cohorts, case controls, and cross-sectional studies, amongst others)	• reviews (except those included in the evidence summary) • guidelines • opinion pieces • modelling studies • laboratory studies • ecological studies
Publication type	Published and preprint	

Identification of reviews from scoping search

A scoping search was completed on 31 March 2023 to identify any existing reviews (systematic or rapid), evidence summaries, and review protocols related to the review question. We searched the following review repositories and prospective review registers: Ovid Medline, Ovid Embase, PubMed, Google, Epistemonikos, Cochrane Library and PROSPERO.

Narrative reviews without a systematic search strategy were excluded.

Title and abstract screening was undertaken by one reviewer, with potentially relevant reviews screened by a second reviewer. Screening on full text was undertaken by one reviewer.

To briefly examine the reporting quality of each review, there was also a brief examination of whether the following review components were reported:

- whether a review protocol was written and available
- whether the review's inclusion and exclusion criteria was well reported, including both PICO (population, intervention, comparator, outcome) components and study types
- whether screening and data extraction were performed in duplicate
- whether an appropriate risk of bias assessment was performed

A scoping summary was produced, which identified 12 systematic reviews (17 to 24, 26 to 29) of primary studies published between 1980 and 2021.

Identification of studies for rapid review

We will search Ovid Medline, Ovid Embase and Ovid PsycInfo, Web of Science Core Collection (Science Citation Index and Social Science Citation Index only), Cochrane CENTRAL (trials database), and Europe PMC (for preprints) for studies published between 1 January 2020 and 25 May 2023. The search strategy will be checked by another information specialist. All search strategies are presented below.

Duplicates will be removed using Deduklick automated duplicate removal software.

Screening for rapid review

Screening on title and abstract will be undertaken in duplicate by 2 reviewers for at least 20% of the eligible studies, with the remainder completed by one reviewer. Disagreement will be resolved by discussion.

Screening on full text will be undertaken by one reviewer and checked by a second.

Data extraction

Summary information for each primary study will be extracted and reported in tabular form. Information will include country, study period, study design, participants, results, settings, and any relevant contextual data. This will be undertaken by one reviewer and checked by a second.

The 12 systematic reviews identified from the scoping search will be summarised in an evidence summary, including key components such as the methods used, evidence identified, a summary of findings, the limitations of the review and the reporting quality. Data extraction will be performed by one reviewer and checked by a second.

Risk of bias assessment

The Quality Criteria Checklist will be used to assess risk of bias in primary studies (32), and the AMSTAR 2 checklist will be used to assess risk of bias in the previously identified reviews. All risk of bias assessments will be completed by one reviewer and checked by a second.

Synthesis

A narrative synthesis will be written to describe the results from both previously identified reviews and primary studies identified in the rapid review.

Variations across populations and subgroups, for example cultural variations or differences between ethnic or social groups will be considered, where evidence is available.

Search strategy

Database: Ovid MEDLINE(R) ALL (1946 to 24 May 2023)

1. exp Correctional Facilities/ (11426)
2. exp Prisoners/ (18467)
3. (prison* or incarcerat* or inmate* or imprison*).tw,kf. (34253)
4. (jail* or penitentiar* or detention or detainee*).tw,kf. (9144)
5. (criminal justice or justice system).tw,kf. (6812)
6. (gaol* or offender* or convict or convicts or convicted or custody or custodial or criminal*).tw,kf. (41678)
7. (secure adj5 (setting* or environment* or estate* or institut* or facilit*)).tw,kf. (1538)
8. penal.tw,kf. (1808)
9. (correction* adj5 (setting* or environment* or estate* or institut* or facilit*)).tw,kf. (4217)
10. ((migrant* or emigrant* or immigrant* or immigrat* or asylum*) adj5 removal*).tw,kf. (46)
11. ((migrant* or emigrant* or immigrant* or immigrat* or asylum*) adj5 deport*).tw,kf. (155)
12. or/1-11 (84438)
13. PWID.tw,kf. (2581)
14. (IDUs or IDU).tw,kf. (5824)
15. Substance Abuse, Intravenous/ (16745)
16. Drug Users/ (4040)
17. exp Drug Misuse/ (17307)
18. Needles/ (17290)
19. Syringes/ (6752)
20. Needle Sharing/ (1755)
21. needle*.tw,kf. (136369)
22. syringe*.tw,kf. (20363)
23. hypodermic*.tw,kf. (1899)
24. intravenous*.tw,kf. (379393)
25. inject*.tw,kf. (833382)
26. Heroin Dependence/ or Morphine Dependence/ or Opium Dependence/ or Cocaine-Related Disorders/ (21133)
27. Substance-Related Disorders/ (105283)
28. exp Opioid-Related Disorders/ (33924)
29. exp Cocaine/ or Amphetamine-Related Disorders/ or Cocaine-Related Disorders/ or exp Synthetic Drugs/ or exp Amphetamine/ (54463)
30. ((amphetamine* or cocaine or stimulant* or opiate* or opioid or heroin or synthetic or substance* or drug* or narcotic*) and (abus* or depend* or us* or misus* or addict* or disorder*)).tw,kf. (1735386)
31. exp Body Modification, Non-Therapeutic/ (11819)

32. (piercing* or pierce*).tw,kf. (5749)
33. tatoo*.tw,kf. (108)
34. tattoo*.tw,kf. (5871)
35. body modification*.tw,kf. (204)
36. exp Injections/ (296759)
37. exp Administration, Intravenous/ (148656)
38. or/13-37 (3051165)
39. 12 and 38 (17341)
40. limit 39 to dt=20200101-20230525 (3134)

Database: Embase (1974 to 24 May 2023)

1. exp detention center/ (3170)
2. exp prisoner/ (18930)
3. (prison* or incarcerat* or inmate* or imprison*).tw,kf. (40992)
4. (jail* or penitentiar* or detention or detainee*).tw,kf. (11795)
5. (criminal justice or justice system).tw,kf. (8237)
6. (gaol* or offender* or convict or convicts or convicted or custody or custodial or criminal*).tw,kf. (51332)
7. (secure adj5 (setting* or environment* or estate* or institut* or facilit*)).tw,kf. (2232)
8. penal.tw,kf. (2604)
9. (correction* adj5 (setting* or environment* or estate* or institut* or facilit*)).tw,kf. (5367)
10. ((migrant* or emigrant* or immigrant* or immigrat* or asylum*) adj5 removal*).tw,kf. (48)
11. ((migrant* or emigrant* or immigrant* or immigrat* or asylum*) adj5 deport*).tw,kf. (158)
12. or/1-11 (101401)
13. PWID.tw,kf. (3856)
14. (IDUs or IDU).tw,kf. (8094)
15. injection drug user/ (4502)
16. exp drug misuse/ (11282)
17. intravenous drug abuse/ (10524)
18. exp intravenous drug administration/ (375212)
19. exp "drug use"/ (379756)
20. exp needle/ (75141)
21. syringe/ or hypodermic syringe/ (21297)
22. needle sharing/ (637)
23. exp injection/ (175012)
24. heroin dependence/ or morphine addiction/ or opiate addiction/ or cocaine dependence/ (51396)
25. drug dependence/ or exp narcotic dependence/ (105029)
26. cocaine/ or amphetamine dependence/ or amphetamine abuse/ or amphetamine/ (86615)
27. needle*.tw,kf. (198458)
28. syringe*.tw,kf. (28416)
29. hypodermic*.tw,kf. (2008)
30. intravenous*.tw,kf. (519677)

31. inject*.tw,kf. (1118636)
32. ((amphetamine* or cocaine or stimulant* or opiate* or opioid or heroin or synthetic or substance* or drug* or narcotic*) and (abus* or depend* or us* or misus* or addict* or disorder*)).tw,kf. (2459915)
33. exp body modification/ (4934)
34. (piercing* or pierce*).tw,kf. (7539)
35. tatoo*.tw,kf. (169)
36. tattoo*.tw,kf. (8391)
37. body modification*.tw,kf. (312)
38. or/13-37 (4478967)
39. 12 and 38 (22489)
40. limit 39 to dc=20200101-20230525 (4992)

Database: APA PsycInfo (2002 to Week 3 May 2023)

1. exp correctional institutions/ (8516)
2. incarcerated/ (7539)
3. incarceration/ (5768)
4. (prison* or incarcerat* or inmate* or imprison*).tw. (28430)
5. (jail* or penitentiar* or detention or detainee*).tw. (7441)
6. (criminal justice or justice system).tw. (15229)
7. (gaol* or offender* or convict or convicts or convicted or custody or custodial or criminal*).tw. (58430)
8. (secure adj5 (setting* or environment* or estate* or institut* or facilit*)).tw. (1541)
9. penal.tw. (1833)
10. (correction* adj5 (setting* or environment* or estate* or institut* or facilit*)).tw. (3612)
11. ((migrant* or emigrant* or immigrant* or immigrat* or asylum*) adj5 removal*).tw. (43)
12. ((migrant* or emigrant* or immigrant* or immigrat* or asylum*) adj5 deport*).tw. (245)
13. or/1-12 (81126)
14. PWID.tw. (1241)
15. (IDUs or IDU).tw. (1805)
16. exp drug abuse/ (36146)
17. drug dependency/ (8873)
18. drug addiction/ (7049)
19. exp intravenous drug usage/ (3576)
20. drug usage/ (16473)
21. needle sharing/ (276)
22. "substance use disorder"/ (10466)
23. needle*.tw. (4062)
24. syringe*.tw. (1884)
25. hypodermic*.tw. (22)
26. intravenous*.tw. (9525)
27. inject*.tw. (42072)
28. exp "opioid use disorder"/ or exp cocaine/ or exp amphetamines/ (21126)

29. ((amphetamine* or cocaine or stimulant* or opiate* or opioid or heroin or synthetic or substance* or drug* or narcotic*) and (abus* or depend* or us* or misus* or addict* or disorder*)).tw. (223386)
30. body modification/ (400)
31. (piercing* or pierce*).tw. (900)
32. tatoo*.tw. (6)
33. tattoo*.tw. (635)
34. body modification*.tw. (276)
35. exp injections/ (4519)
36. or/14-35 (266186)
37. 13 and 36 (14177)
38. limit 37 to yr="2020 -Current" (2386)

Web of Science Core Collection (Science Citation Index and Social Science Citation Index only) (Date of search 25 May 2023)

TS=((prison* or incarcerat* or inmate* or imprison*)) OR TS=((jail* or penitentiar* or detention or detainee*)) OR TS=(("criminal justice" or "justice system")) OR TS=((gaol* or offender* or convict or convicts or convicted or custody or custodial or criminal*)) OR TS=((secure NEAR/4 (setting* or environment* or estate* or institut* or facilit*))) OR TS=(penal) OR TS=((correction* NEAR/4 (setting* or environment* or estate* or institut* or facilit*))) OR TS=(((migrant* or emigrant* or immigrant* or immigrat* or asylum*) NEAR/4 removal*)) OR TS=(((migrant* or emigrant* or immigrant* or immigrat* or asylum*) NEAR/4 deport*))

And

TS=(PWID) OR TS=(IDUs or IDU) OR TS=(needle*) OR TS=(syringe*) OR TS=(hypodermic*) OR TS=(intravenous*) OR TS=(inject*) OR TS=((amphetamine* or cocaine or stimulant* or opiate* or opioid or heroin or synthetic or substance* or drug* or narcotic*) and (abus* or depend* or use* OR using OR user* or misus* or addict* or disorder*)) OR TS=(piercing* or pierce*) OR TS=(tatoo*) OR TS=(tattoo*) OR TS=("body modification*")

Date limited 2020 to current
4,017 results

Cochrane CENTRAL (Date of search 25 May 2023)

1. MeSH descriptor: [Correctional Facilities] explode all trees 188
2. MeSH descriptor: [Prisoners] explode all trees 421
3. prison* or incarcerat* or inmate* or imprison* 2085
4. (jail* or penitentiar* or detention or detainee*) 673
5. ("criminal justice" or "justice system") 731
6. (gaol* or offender* or convict or convicts or convicted or custody or custodial or criminal*) 2558

7. (secure NEAR/4 (setting* or environment* or estate* or institut* or facilit*)) 165
8. penal 37
9. (correction* NEAR/4 (setting* or environment* or estate* or institut* or facilit*)) 388
10. ((migrant* or emigrant* or immigrant* or immigrat* or asylum*) NEAR/4 removal*) 2
11. ((migrant* or emigrant* or immigrant* or immigrat* or asylum*) NEAR/4 deport*) 6
12. #1 OR #2 OR #3 OR #4 OR #5 OR #6 OR #7 OR #8 OR #9 OR #10 OR #11 4620
13. PWID 218
14. (IDUs or IDU) 410
15. MeSH descriptor: [Substance Abuse, Intravenous] explode all trees 487
16. MeSH descriptor: [Drug Users] explode all trees 144
17. MeSH descriptor: [Drug Misuse] explode all trees 460
18. MeSH descriptor: [Needles] explode all trees 1404
19. MeSH descriptor: [Syringes] explode all trees 302
20. MeSH descriptor: [Needle Sharing] explode all trees 58
21. needle* 19914
22. syringe*6099
23. hypodermic* 178
24. intravenous* 112200
25. inject* 122989
26. MeSH descriptor: [Heroin Dependence] this term only 713
27. MeSH descriptor: [Morphine Dependence] this term only 35
28. MeSH descriptor: [Opium Dependence] this term only 2
29. MeSH descriptor: [Cocaine-Related Disorders] this term only 1177
30. MeSH descriptor: [Substance-Related Disorders] this term only 4878
31. MeSH descriptor: [Opioid-Related Disorders] explode all trees 2678
32. MeSH descriptor: [Cocaine] explode all trees 1066
33. MeSH descriptor: [Amphetamine-Related Disorders] this term only 341
34. MeSH descriptor: [Cocaine-Related Disorders] this term only 1177
35. MeSH descriptor: [Synthetic Drugs] explode all trees 12
36. MeSH descriptor: [Amphetamine] explode all trees 1056
37. ((amphetamine* or cocaine or stimulant* or opiate* or opioid or heroin or synthetic or substance* or drug* or narcotic*) and (abus* or depend* or us* or misus* or addict* or disorder*)) 752346
38. MeSH descriptor: [Body Modification, Non-Therapeutic] explode all trees 427
39. (piercing* or pierce*) 1449
40. tatoo* 31
41. tattoo* 281
42. "body modification*" 6
43. MeSH descriptor: [Injections] explode all trees 24971
44. MeSH descriptor: [Administration, Intravenous] explode all trees 20357
45. #13 AND #44 842584
46. #12 AND #45 2311
47. Filtered to CENTRAL records only and date limited 01/01/2020 – current 505

Europe PMC (Date of search 25 May 2023)

(TITLE_ABS:prison* OR TITLE_ABS:incarcerat* OR TITLE_ABS:inmate* OR TITLE_ABS:imprison* OR TITLE_ABS:jail* OR TITLE_ABS:penitentiar* OR TITLE_ABS:detention OR TITLE_ABS:detaine* OR TITLE_ABS:”criminal justice” OR TITLE_ABS:offender* OR TITLE_ABS:”correctional setting” OR TITLE_ABS:”custodial setting” OR TITLE_ABS:”secure setting”) AND (TITLE_ABS:PWID OR TITLE_ABS:IDU OR TITLE_ABS:inject* OR TITLE_ABS:intravenous* OR TITLE_ABS:needle* OR TITLE_ABS:syringe* OR TITLE_ABS:hypodermic* OR TITLE_ABS:”drug user” OR TITLE_ABS:”drug users” OR TITLE_ABS: “drug dependence” OR TITLE_ABS:pierc* OR TITLE_ABS:”body modification” OR TITLE_ABS:tattoo*)

Limit to preprints only, custom date range 2020 to 2023.

PRISMA diagram

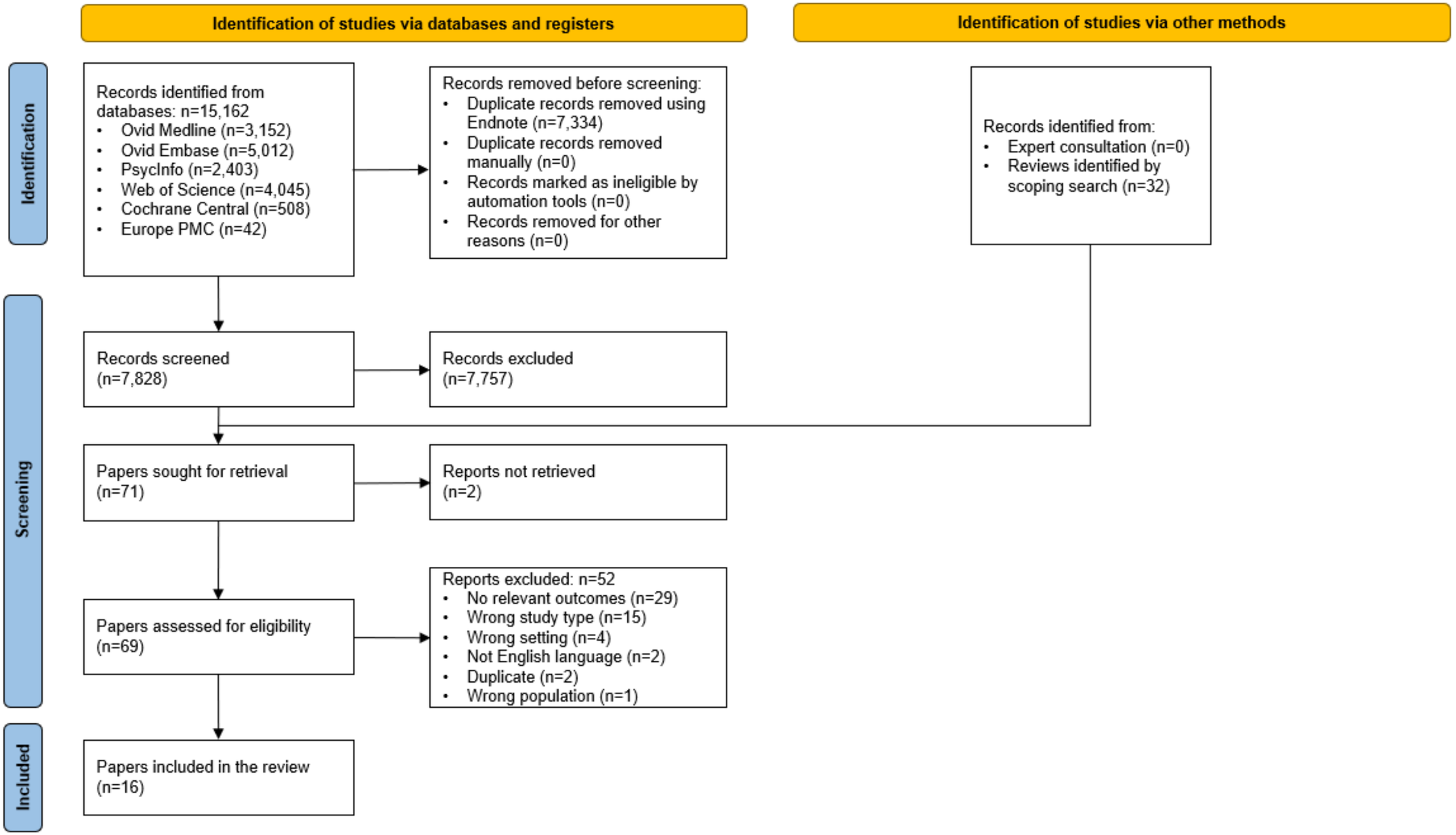

Figure A.1. PRISMA diagram – alternative text

A PRISMA diagram showing the flow of studies through this review, ultimately including 16 studies concerning interventions to reduce infection related harms in people who inject drugs were included in this review.

From identification of studies via databases for the studies, n=15,162 records were identified from the databases:

- Ovid Medline (n=3,152)
- Ovid Embase (n=5,012)
- PsycInfo (n=2,403)
- Web of Science (n=4,045)
- Cochrane Central (n=508)
- Europe PMC (n=42)

From these, records removed before screening:

- duplicate records removed using Endnote (n=7,334)
- duplicate records removed manually (n=0)
- records marked as ineligible by automation tools (n=0)
- records removed for other reasons (n=0)

N=7,828 records screened, of which n=7,757 were excluded. From identification of studies via other methods, n=0 studies were identified from expert consultation, and n=32 studies were identified from previous reviews. N=71 papers were sought for retrieval, of which n=69 were retrieved (n=2 not retrieved).

Of the n=69 papers assessed for eligibility, n=52 reports were excluded:

- no relevant outcomes (n=29)
- wrong study type (n=15)
- wrong setting (n=4)
- not English language (n=2)
- duplicate (n=2)
- wrong population (n=1)

Overall, n=16 papers included in the review question on health risks of bed bug bites and infestations.

Annexe B. Excluded studies

Exclusion reason: no outcomes (n=29)

Alam F and others. 'Optimising opioid substitution therapy in the prison environment' International journal of prisoner health 2019: volume 15, pages 293 to 307

Arseneault C and others. 'Impact evaluation of an addiction intervention program in a Quebec prison' Substance Abuse: Research and Treatment 2015, issue 9, pages 47 to 57

Berk J and others. 'Injecting opioid use disorder treatment in jails and prisons: the potential of extended-release Buprenorphine in the carceral setting' Journal of Addiction Medicine 2022: volume 16, issue 4, pages 396 to 398

Blue TR and others. 'Longitudinal analysis of HIV-risk behaviors of participants in a randomized trial of prison-initiated buprenorphine' Addiction Science and Clinical Practice 2019: volume 14, page 45

Bryan A and others. 'Effectiveness of an HIV prevention intervention in prison among African Americans, Hispanics and Caucasians' Health Education and Behavior 2006: volume 33, issue 2, pages 154 to 177

Carrieri MP and others. 'Securing opioid substitution treatment access and quality for people who inject drugs' AIDS 2015: volume 29, pages 975 to 976

Cepeda J and others. 'Integrating antiretroviral treatment and harm reduction services on HIV and overdose' Topics in Antiviral Medicine 2020: volume 28, page 435

Cochrane Central Register of Controlled Trials (CENTRAL). 'Comparison of opioid maintenance treatments (OMTs) in prison' 2020

Cochrane Central Register of Controlled Trials (CENTRAL). 'Development and Testing a Counseling strategy for drug and alcohol misuse in prisons' 2022

Cochrane Central Register of Controlled Trials (CENTRAL). 'Exploring the feasibility of a peer-driven intervention to improve HIV prevention among prisoners who inject drugs' 2023

Cochrane Central Register of Controlled Trials (CENTRAL). 'Trial of methadone maintenance versus methadone detox in jail' 2013

Conway A and others. 'A testing campaign intervention consisting of peer-facilitated engagement, point-of-care HCV RNA testing, and linkage to nursing support to enhance

hepatitis C treatment uptake among people who inject drugs: the ETHOS Engage study' Viruses 2022: volume 14, issue 7, page 16

Coulton S and others. 'A multicomponent psychosocial intervention to reduce substance use by adolescents involved in the criminal justice system: the RISKIT-CJS RCT' Public Health Research 2023: volume 11, issue 3, pages 1 to 77

Dore G and others. 'Declining HCV incidence following rapid HCV treatment scale-up in a prison network in Australia: Evidence of treatment as prevention from the SToP-C study' Journal of Hepatology 2020: volume 73, page S127

Hariri S and others. 'An intervention to increase hepatitis C virus diagnosis and treatment uptake among people in custody in Iran' International Journal of Drug Policy 2021: volume 95

Exclusion reason: wrong study design (n=15)

Ferguson C and others. 'Point of care testing for hepatitis C in the priority settings of mental health, prisons and drug and alcohol facilities' Journal of Hepatology 2022: volume 77, page S228

Fiore V and others. 'HCV spread among female incarcerated population and treatment pathways to viral elimination in Italian prison settings: clinical perspectives and medico legal aspects' BMC Infectious Diseases 2022: volume 22, issue 1, page 601

Fiore V and others. 'HCV testing and treatment initiation in an Italian prison setting: A step-by-step model to micro-eliminate hepatitis C' International Journal of Drug Policy 2021: volume 90, page 103,055

Giuliani R and others. 'HCV micro-elimination in 2 prisons in Milan, Italy: A model of care' Journal of Viral Hepatitis 2020: volume 27, issue 12, pages 1,444 to 1,454

Godin A and others. 'The role of prison-based interventions for hepatitis C virus (HCV) micro-elimination among people who inject drugs in Montreal, Canada'. International Journal of Drug Policy 2021: volume 88, pages 102,738

Grinstead OA and others. ‘Reducing postrelease HIV risk among male prison inmates: A peer-led intervention’ Criminal Justice and Behavior 1999: volume 26, issue 4, pages 453 to 465

Hajarizadeh B and others. 'Evaluation of hepatitis C treatment-as-prevention within Australian prisons (SToP-C): a prospective cohort study' The Lancet: Gastroenterology and Hepatology 2021: volume 6, issue 7, pages 533 to 546

Haridy J and others. 'A novel eHealth model of care to effectively manage chronic hepatitis C in community and prison-based settings' Journal of Gastroenterology and Hepatology (Australia) 2020: volume 35, pages 69 to 70

Jacob J and others. 'The transfer of harm-reduction strategies into prisons: needle exchange programmes in two German prisons' International Journal of Drug Policy 2000: volume 11, pages 325 to 335

Kinlock TW and others. 'A randomized clinical trial of methadone maintenance for prisoners: results at one-month post-release' Drug Alcohol Depend 2007: volume 91, issues 2 to 3, pages 220 to 227

Kronfli N and others. 'A randomized pilot study assessing the acceptability of rapid point-of-care hepatitis C virus (HCV) testing among male inmates in Montreal, Canada' International Journal of Drug Policy 2020: volume 85, page 102,921

Kronfli N and others. 'Disparities in hepatitis C care across Canadian provincial prisons: Implications for hepatitis C micro-elimination' Canadian Liver Journal 2021: volume 4, issue 3, pages 292 to 310

Lier AJ and others. 'Extended-release naltrexone lowers injection use in justice-involved persons with HIV' Topics in Antiviral Medicine 2022: volume 30, pages 341 to 342

Lier AJ and others. 'Maintenance on extended-release naltrexone is associated with reduced injection opioid use among justice-involved persons with opioid use disorder' Journal of Substance Abuse Treatment 2022: volume 142, page 108,852

McKenzie M and others. 'A randomized trial of methadone initiation prior to release from incarceration' Substance Abuse 2012: volume 33, issue 1, pages 19 to 29

Meyer JP and others. 'A qualitative study of diphenhydramine injection in Kyrgyz prisons and implications for harm reduction' Harm Reduction Journal 2020: volume 17, issue 1, page 86

Mohamed Z and others. 'Time matters: point of care screening and streamlined linkage to care dramatically improves hepatitis C treatment uptake in prisoners in England' International Journal of Drug Policy 2020: volume 75, page 8

Nafekh M. 'Evaluation report: correctional service Canada's Safer Tattooing Practices Pilot Initiative' 2009

Pang J and others. 'Experiences with criminal justice system and HIV/Hepatitis C testing among people who inject drugs (PWID) in Selangor, Malaysia' Journal of the International Aids Society 2022: volume 25, pages 157 to 158

Ramsey SE and others. 'Linking women experiencing incarceration to community-based HIV pre-exposure prophylaxis care: protocol of a pilot trial' Addiction Science and Clinical Practice 2019: volume 14, page 8

Sacks JY and others. 'Prison therapeutic community treatment for female offenders: Profiles and preliminary findings for mental health and other variables (crime, substance use and HIV risk)' Journal of Offender Rehabilitation 2008: volume 46, issues 3 to 4, pages 233 to 261

Sheehan Y and others. 'A 'one-stop-shop' point-of-care hepatitis C RNA testing intervention to enhance treatment uptake in a reception prison: the PIVOT study' Journal of Hepatology 2023: volume 26, page 26

Soholm J and others. 'Incidence, prevalence and risk factors for hepatitis C in Danish prisons' PloS One 2019: volume 14, issue 7

Stirrup T and others. 'Hepatitis c virus high intensity test and treat hmp leeds' Gut 2020: volume 69, pages A42 to A43

Stirrup T and others. 'Micro-elimination in prisons: a high-intensity test and treat (HITT) programme' Journal of Hepatology 2020: volume 73, page S329

Stover H and others. 'The state of harm reduction in prisons in 30 European countries with a focus on people who inject drugs and infectious diseases' Harm Reduction Journal 2021: volume 18, issue 1, page 67

Supanan R and others. 'Brief Report: HCV Universal Test-and-Treat With Direct Acting Antivirals for Prisoners With or Without HIV: A Prison Health Care Workers-Led Model for HCV Microelimination in Thailand' Journal of Acquired Immune Deficiency Syndromes 2021: volume 88, pages 465 to 469

Teti E and others. 'HCV elimination in active PWID: SOF/VEL as a simple tool to implement a test and treat approach in this vulnerable population' Hepatology 2020: volume 72, pages 559A to 560A

Ward Z and others. 'Cost-effectiveness of mass screening for HCV in an Irish prison' Journal of Hepatology 2020: volume 73, page S832

Ward Z and others. 'Cost-effectiveness of mass screening for Hepatitis C virus among all inmates in an Irish prison' International Journal of Drug Policy 2021: volume 96, page 103,394

Wolitski RJ. 'Relative efficacy of a multisession sexual risk-reduction intervention for young men released from prisons in 4 states' American Journal of Public Health 2006: volume 96, issue 10, pages 1,854 to 1,861

Wong A and others. 'Value of SOF/VEL as pangenotypic panfibrotic HCV treatment in implementing a test and treat strategy in prisons: real-world care management from 6 countries' Hepatology 2020: volume 72, pages 578A to 579A

Yu ML and others. 'Outreach onsite treatment with a simplified pangenotypic directacting antiviral regimen for hepatitis C virus micro-elimination in a prison' Hepatology International 2022: volume 16, page S207

Exclusion reason: wrong setting (n=4)

Conway A and others. 'A Testing campaign intervention consisting of peer-facilitated engagement, point-of-care HCV RNA testing, and linkage to nursing support to enhance hepatitis C treatment uptake among people who inject drugs: the ETHOS Engage Study' Viruses 2022: volume 14, issue 7, page 16

Coulton S and others. 'A multicomponent psychosocial intervention to reduce substance use by adolescents involved in the criminal justice system: the RISKIT-CJS RCT' Public Health Research 2023: volume 11, issue 3, pages 1 to 77

Hser YI and others. 'Pilot trial of a recovery management intervention for heroin addicts released from compulsory rehabilitation in China' Journal of Substance Abuse Treatment 2013: volume 44, issue 1, pages 78 to 83

Lier AJ and others. 'Maintenance on extended-release naltrexone is associated with reduced injection opioid use among justice-involved persons with opioid use disorder' Journal of Substance Abuse Treatment 2022: volume 142, page 108,852

Exclusion reason: duplicate (n=2)

Mohamed Z and others. 'Time matters: Point of care screening and streamlined linkage to care dramatically improves hepatitis C treatment uptake in prisoners in England' International Journal of Drug Policy 2020: volume 75, page 8

Ward Z and others. 'Cost-effectiveness of mass screening for Hepatitis C virus among all inmates in an Irish prison' International Journal of Drug Policy 2021: volume 96, page 103,394

Exclusion reason: study not retrieved (n=2)

Vegue González M. ABE, García Pastor S. 'Evaluación de un programa de metadona en prisión. Resultados preliminares [Evaluation of a methadone programme in prison. Preliminary results]' Adicciones 1998: volume 10, pages 59 to 67

Zamani S. 'Pattern of drug-related risk behaviours after the introduction of methadone maintenance treatment or a needle/syringe exchange program among drug-using prisoners in 2 prisons in Iran. Final Report for the Paolo Pertica Fellowship' 2010

Exclusion reason: not in English (n=2)

Heinemann A and others. 'Prevention of bloodborne virus infections among drug users in an open prison by syringe vending machines'. Sucht: Interdisciplinary Journal of Addiction Research 2001: volume 47, issue 1, pages 57 to 65 [this study was still included using information from the identified systematic reviews]

Mallada P, Marco, A., editor Programa de tratamiento en drogodependientes de la población penitenciaria [Drug treatment among drug dependent prisoners]. Congreso de la Sociedad Española de Toxicomanías; 1993; Valencia: Avances de la Investigación sobre Drogodependencias.

Exclusion reason: wrong population (n=1)

Magura S and others. 'Buprenorphine and methadone maintenance in jail and post-release: a randomized clinical trial' Drug Alcohol Depend 2009: volume 99, issues 1 to 3, pages 222 to 230

Annexe C. Data extraction table

Table C.1. Characteristics of relevant reviews
Acronyms: HIV = Human Immunodeficiency virus, RCT = Randomised Controlled Trial

Reference	Methods	Studies identified	Critical appraisal
Durjava and others 2018 (17) 'Effectiveness of prison based opioid substitution treatment: a systematic review'	Search dates: Between 2003 and 2017 Data sources: Medline, PsycINFO, Science direct Inclusion criteria: Studies reporting in prison or post release outcomes of prison based opioid substitution treatment for opioid dependent prisoners Exclusion criteria: Studies that did not report in prison or post release outcomes of prison based opioid substitution treatment Screening and data extraction: Not stated if duplicate screening and data extraction were performed Risk of bias assessment: Unclear if performed	One RCT: Dolan and others: 'A randomised controlled trial of methadone maintenance treatment versus waiting list control in an Australian prison system' (1) Two observational studies: • Kinner and others: 'Opiate substitute treatment to reduce in-prison drug injection: A natural experiment' (4) • Tetsch and others: 'Incidence of primary hepatitis C infection and risk factors for transmission in an Australian prisoner cohort' (8)	Limitations: • list of excluded studies and justifications for excluding not provided • no protocol available • not comprehensive search strategy • unclear if risk of bias assessment performed (no results presented if conducted) • unclear if screening and data extraction were done in duplicate AMSTAR 2 rating: critically low
Hedrich and others 2011 (18) 'The effectiveness of opioid maintenance treatment in prison settings: a systematic review'	Search dates: Until January 2011 Data sources: AGRIS, EMBASE, HMIC, International Pharmaceutical abstracts, Ovid Medline, PsycINFO, PsycARTICLES and Social Policy and Practice databases. Also search specialist journals and EMCDDA library Inclusion criteria: • experimental and observational studies • studies reporting outcomes of prison based opioid maintenance treatment for opioid dependent inmates • studies conducted in correctional facilities Exclusion criteria: Not stated Screening and data extraction:	One RCT: Dolan and others: 'A randomised controlled trial of methadone maintenance treatment versus waiting list control in an Australian prison system' (1). Risk of bias assessment results: may underestimate treatment effects as there was a risk of contamination between groups. One quasi RCT: Bayanzadeh and others: 'A study of the effectiveness of psychopharmacological and psychological interventions in reducing harmful/high risk behaviours among substance user prisoners' (16). Risk of bias assessment results: unclear impact on treatment effects, potential biases included attrition and risk of contamination between groups. Unclear if ethical review was conducted. Two observational studies:	Limitations: • list of excluded studies and justifications for excluding not provided • no protocol available • source of funding of included studies not specified AMSTAR 2 rating: critically low

Reference	Methods	Studies identified	Critical appraisal
	Screening and data extraction was done by 2 reviewers Risk of bias assessment: Individual studies were assessed using criteria recommended by the Cochrane Handbook (including information on differential follow-up bias, self-report bias, group comparability, selection bias and adjustment for confounding). Risk of biases for each study were reported individually and their potential impact on effect estimates (unclear impact on treatment effects, potentially overestimate treatment effects or potentially underestimate treatment effects).	• Dolan and others: 'Methadone maintenance treatment reduces heroin injection in New South Wales prisons' (3) Risk of bias assessment results: may underestimate treatment effects as there was a risk of contamination between groups • Tetsch and others: 'Incidence of primary hepatitis C infection and risk factors for transmission in an Australian prisoner cohort' (8) Risk of bias assessment results: unclear impact on treatmeant effects, potential biases included potential under-reporting of illegal activites carried out in prison, methadone treatment status at time of positive hepatitis C infection may have been different to enrollment and differences in treatment continuity or uptake of treatment in individuals at higher risk of HCV	
Larney and others 2010 (19) 'Does opioid substitution treatment in prisons reduce injecting-related HIV risk behaviours? A systematic review'	Search dates: Not stated Data sources: PubMed, Scopus and Web of Science Inclusion criteria: • randomised and non-randomised studies • a 2-group design that compared treated and untreated inmates with a history of illicit opioid use • studies reporting results related to injecting drug use, needle and syringe sharing or HIV incidence in prison Exclusion criteria: Not stated Screening and data extraction: Not stated if duplicate screening and data extraction were performed Risk of bias assessment: Individual studies were assessed using the Cochrane Consumers and Communication Review Group Study Quality Guide, reporting information on allocation method, group comparability at baseline, follow-up rate, use of intention-to-treat methods to analyse data. No overall risk of bias assessment rating was reported.	One RCT: Dolan and others: 'A randomised controlled trial of methadone maintenance treatment versus waiting list control in an Australian prison system' (1) Risk of bias assessment results: potential for bias in allocation method (block randomisation). One quasi RCT: Bayanzadeh and others: 'A study of the effectiveness of psychopharmacological and psychological interventions in reducing harmful/high risk behaviours among substance user prisoners' (16). Risk of bias assessment results: potential for bias in allocation method (participants were numbered sequentially and allocated based on even or odd numbers), lower follow-up rate in control group (52%) compared to treatment group (63%). Unclear if ethical review was conducted. One observational study: Dolan and others: 'Methadone maintenance treatment reduces heroin injection in New South Wales prisons' (3). Risk of bias assessment results: non-randomised allocation, potential for bias in group comparability (treatment group older and less likely to be indigenous than control grup).	Limitations: • details of included studies not given • list of excluded studies and justifications for excluding not provided • no protocol available • not comprehensive search strategy • source of funding of included studies not specified • unclear if screening and data extraction were done in duplicate AMSTAR 2 rating: critically low

Reference	Methods	Studies identified	Critical appraisal
Lazarus and others 2018 (20) 'Health Outcomes for Clients of Needle and Syringe Programs in Prisons'	Search dates: From inception to January 26, 2017 Data sources**:** MEDLINE, Embase, PsycINFO and CINAHL Inclusion criteria: • studies focusing on prison needle and syringe programs • studies reporting any health outcomes as a result of the intervention • studies reporting needle and syringe programs specific sub analysis • studies reporting any health outcome in people who inject drugs in prisons • all study designs Exclusion criteria: • articles published as comments, editorials, letters, or narrative reviews • epidemiological studies • studies addressing diagnosis or treatment of HIV, tuberculosis hepatitis, drug consumption not related to needle and syringe programs. Screening and data extraction: Two reviewers screened the articles, extracted the data, and compared the findings Risk of bias assessment: Unclear if performed	Four observational studies: • Ferrer and others: 'Evaluation of a Needle Exchange Program at Pereiro de Aguiar prison (Ourense, Spain): A 10 year experience' (10) • Nelles and others: 'Provision of syringes: the cutting edge of harm reduction in prison' (15) • Stark and others: 'A syringe exchange programme in prison as prevention strategy against HIV infection and hepatitis B and C in Berlin, Germany' (12) • Heinemann and others: 'Prevention of bloodborne virus infections among drug users in an open prison by syringe vending machines' (11)	Limitations: • details of included studies not given • list of excluded studies and justifications for excluding not provided • no protocol available • not comprehensive search strategy • source of funding of included studies not specified • unclear if risk of bias assessment performed (no results presented if conducted) AMSTAR 2 rating: critically low
Palmateer and others 2022 (21) 'Interventions to prevent HIV and Hepatitis C among people who inject drugs: Latest evidence of effectiveness from a systematic review (2011 to 2020)'	Search dates: Overview of reviews: 1 January 2011 to 1 June 2020 Search for primary studies: 1 January 2011 to 27 October 2020 Data sources**:** MEDLINE, EMBASE, PsycINFO, CINAHL, Web of Science and Cochrane library Inclusion criteria: • RCTs, non-randomised studies, case control studies, and ecological studies • studies including people who inject drugs	Two observational studies: • Cunningham and others: 'Ongoing incident hepatitis C virus infection among people with a history of injecting drug use in an Australian prison setting, 2005-2014: The HITS-p study' (9) • Heinemann and others: 'Prevention of bloodborne virus infections among drug users in an open prison by syringe vending machines' (11)	Limitations: • critical appraisal of primary studies was not undertaken • inclusion of study design not justified • list of excluded studies and justifications for excluding not provided • not comprehensive search strategy AMSTAR 2 rating: critically low

Reference	Methods	Studies identified	Critical appraisal

	• studies looking at the following interventions:
	  ○ opioid agonist therapy
	  ○ needle syringe program
	  ○ psychosocial interventions
	  ○ drug consumptions rooms
	• studies reporting the following outcomes:
	  ○ prevention of hepatitis C and HIV infection
	  ○ injecting risk behaviour
	
	Exclusion criteria:
	• qualitative studies, cost effective studies, mathematical modelling studies, and ecological studies (where the impact of multiple interventions cannot be separated)
	• people who inject drugs for medical purpose and non-injecting drug users
	• self-reported outcomes
	
	Screening and data extraction:
	Two independent reviewers screened abstracts and full texts for relevance. Disagreements were resolved by a third reviewer. Two reviewers extracted data from the reviews using a predefined form, a third reviewer resolved discrepancies.
	
	Risk of bias assessment: Not performed for primary studies (reviews were assessed using AMSTAR-2		

Seval and others 2020 (22) 'The Impact of Medications for Opioid Use Disorder on Hepatitis C Incidence Among Incarcerated Persons'	Search dates: From inception until December 2019 Data sources**:** Cochrane library, Ovid Medline, Ovid Embase, PubMed, Scopus, Google Scholar, and Web of Science Inclusion criteria: • studies that took place in prison or jail • studies reporting medications for opioid use disorder received by detainees • studies reporting either incident hepatitis C infection or reinfection Exclusion criteria: • studies that took place in alternate settings such as community supervision, detention, or noncriminal justice locations	One RCT: Dolan and others: 'A randomised controlled trial of methadone maintenance treatment versus waiting list control in an Australian prison system' (1) Risk of bias assessment results: low risk of bias in random sequence generation, allocation concealment, selective reporting, incomplete outcome data or other bias. Potential bias was scored as unclear in blinding of participants and personell, as well as blinding of outcome assessment. Five observational studies: • Cunningham and others: 'Ongoing incident hepatitis C virus infection among people with a history of injecting drug use in an Australian prison setting, 2005-2014: The	Limitations: • inclusion of study design not justified • not comprehensive search strategy • publication bias not assessed in meta-analysis AMSTAR 2 rating: critically low

Reference	Methods	Studies identified	Critical appraisal
	• reviews, editorials, and commentary articles Screening and data extraction: • two independent reviewers screened title and abstracts and full texts, with a third reviewer to resolve discrepancies • data was extracted by one reviewer and checked for accuracy by a second reviewer Risk of bias assessment: For the RCT, the Cochrane risk of bias tool was used. For cohort studies, the Newcastle-Ottawa 'star-system' cohort scale was used to assess bias for the categories, with each study assigned a score of up to 9 by assessing risk of bias in 3 key domains: selection of study groups, comparability of groups, and measurement of exposure and outcomes. The adapted Newcastle-Ottawa was used to assess risk of bias in cross-sectional studies, with each study assigned a score of up to 5 by assessing selection of study groups and measurement of exposure and outcomes.	HITS-p study' (9). Risk of bias assessment results: scored 9 out of 9 points • Marco and others: 'Hepatitis C reinfection among prisoners with sustained virological response after treatment for chronic hepatitis C' (5) Risk of bias assessment results: scored 7 out of 9 points • Marco and others: 'Incidence of hepatitis C infection among prisoners by routine laboratory values during a 20 year period' (6) Risk of bias assessment results: scored 6 out of 9 points • Taylor and others: 'Low incidence of hepatitis C virus among prisoners in Scotland' (7) Risk of bias assessment results: scored 4 out of 5 points	
Underhill and others 2014 (23) 'HIV Prevention for Adults with Criminal Justice Involvement: A Systematic Review of HIV Risk Reduction Interventions in Incarceration and Community Settings'	Search dates: Until January 6, 2014 Data sources**:** PubMed, PsycINFO, EMBASE, CENTRAL, the National Criminal Justice Reference Service, Criminal Justice Abstracts, Global Health, the Cumulative Index to Nursing and Allied Health Literature, the Education Resources Information Center, the Allied and Complementary Medicine Database and other relevant abstracts resources. Inclusion criteria: • studies which are randomised and quasi randomised controlled trials • studies including adult participants (aged 18 years or older) with criminal justice involvement • studies that reported at least one biological or behavioural outcome related to HIV transmission or HIV testing uptake Exclusion criteria: • studies that only enrolled participants known to be HIV infected • studies including participants who engaged in criminal activity but who lacked involvement with a formal criminal justice system	One RCT: Baxter and others: 'AIDS education in the jail setting' (13). Risk of bias assessment results: method of randomisation not reported, complete case analysis, no attrition analysis results reported. One quasi RCT: Bayanzadeh and others: 'A study of the effectiveness of psychopharmacological and psychological interventions in reducing harmful/high risk behaviours among substance user prisoners' (16). Risk of bias assessments results: randomisation method was alternated row numbers in a list of participants stratified by by type of drug use, baseline differences in participants (details not provided), complete case analysis performed, no attrition analysis results reproted. One observational study: Dolan and others: 'Four-year follow-up of imprisoned male heroin users and methadone treatment: Mortality, re-incarceration and hepatitis C infection' (2). Risk of bias assessment results: method of randomisation of original	Limitations: • list of excluded studies and justifications for excluding not provided • no protocol available • source of funding of included studies not specified AMSTAR 2 rating: critically low

Reference	Methods	Studies identified	Critical appraisal
	• studies looking at interventions that did not list HIV prevention as a program goal Screening and data extraction: Two reviewers independently assessed abstracts and full articles for inclusion and resolved disagreements by discussion and referral to a third reviewer Risk of bias assessment: The Cochrane Risk of Bias assessment tool was used.	RCT was drawing cards from an envelope, complete case analysis performed and no results presented of any attrition analysis however attrition did not appear to differ significantly between groups.	
Wright and others 2011 (24) 'Peer health promotion in prisons: a systematic review'	Search dates: January 1948 to September 2010 Data sources**:** Medline, EMBASE, PsycINFO, CINAHL, Web of Science and the Cochrane database Inclusion criteria: • studies reporting link between peer education and health in prisoner populations • randomised controlled trials, quasi experimental studies, cohort studies, case control studies, and qualitative research Exclusion criteria: Descriptive studies, case studies, case series, editorials, discussion papers, opinion pieces and letters Screening and data extraction: Screening of abstracts and full articles was done independently by the reviewers, discrepancies were resolved by discussion with a third author. Risk of bias assessment: Bias was assessed by custom criteria specified in review protocol which were drawn from the Cochrane Handbook. The authors stated that more weight was given to studies with higher methodological rigour, but the results of this risk of bias assessment was not reported in the review.	One observational study: Dolan and others: 'HIV education in a Siberian prison colony for drug dependent males' (14)	Limitations: • not comprehensive search strategy • list of excluded studies and justifications for excluding not provided • results of risk of bias assessment not reported • source of funding of included studies not specified AMSTAR 2 rating: critically low

Table C.2. Data extraction from primary studies

Acronyms: AIDS = acquired immunodeficiency syndrome, CI = confidence interval, ERR = event rate ratio, HBV= Hepatitis B virus, HCV= Hepatitis C virus, HIV= Human Immunodeficiency virus, HR= Hazard ratio, QCC= Quality Criteria Checklist, RCT = randomised controlled trial, RR = Relative Risk, SD = standard deviation, SE = standard error, SVR12 = sustained virological response at least 12 weeks after treatment

Table C.2a. Experimental studies (randomised controlled trials and quasi randomised controlled trials)

Reference	Country and time period	Setting and participants	Interventions	Relevant outcomes	Risk of bias
Bayanzadeh and others 2004 (16) Primary study identified from reviews: Hedrich and others 2011 (18) Larney and others 2010 (19) Underhill and others 2014 (23) Information for this study was taken from the above reviews, as it was not possible to access the primary study (unpublished)	Iran, time period not reported	Study design: Quasi randomised controlled trial (no true randomisation, participants numbered sequentially and allocated by odd and even numbers). Participants: N=120 heroin dependent male Iranian prisoners, mean age: 35.7 years Prison security classification: Unclear Statistical methods: Unclear	Treated (n=60): heroin dependent prisoners who received opioid maintenance treatment (methadone) as well as cognitive behavioural group therapy, a weekly harm reduction class and a weekly family education visit. Control (n=60): heroin dependent prisoners who received non-methadone treatment of addictions (specifics not provided), as well as psychotherapeutic medications. Outcome measurement: Outcomes measured by multiple consecutive surveys, specific time points when surveys administered was not reported. Follow-up: 6 months (58% retention overall) • n=38 (63%) followed up out of 60 in the treated group • n=31 (52%) followed up out of 60 in the control group	Injecting drug use: • treatment: 11% participants • control: 42% participants • RR for injecting drug use: 0.25, 95% CI: 0.09 to 0.69 Needle and syringe sharing: • treatment: 8% participants • control: 29% participants • RR for needle and syringe sharing: 0.27, 95% CI: 0.08 to 0.92	Not possible to access primary study to assess risk of bias Limitations identified from reviews: • unclear if ethical review was performed • there was contact between the treated and control group • baseline data not fully available to assess selection bias • attrition due to early release, transfer, and death
Baxter and others 1991 (13) Primary study was identified from reviews	US, study time period not reported	Study design: RCT Participants: N=134 prisoners who reported injecting drug use (70% female)	Treated: Participants completed AIDS education programme (8 hour HIV and AIDS education programme in 5 modules delivered over a 2 week period).	Number of participants sharing needles or other drug paraphernalia, (scale range 0 to 20): • treated: mean score 17.3 • control: mean score 15.8 • p value for comparison: p=0.05	Risk of bias: • selection bias: participants were primarily women (more women in jail

Reference	Country and time period	Setting and participants	Interventions	Relevant outcomes	Risk of bias
Underhill and others 2014 (23)		Age: • less than 26 years: n=29 (22%) • 26 to 40 years: n=99 (74%) • more than 41 years: n=6 (5%) Ethnicity: • white: n=90 (67%) • black: n=15 (11%) • Hispanic: n=23 (17%) • native American: n=6 (4.5%) Prison security classification: Minimum and medium level security Statistical methods: In each questionnaire, 3 numerical scales were used to assess needle use in injecting drug users. Mean scores were then calculated from responses to interview questions and a student's t-test was conducted for comparison, with lower scores indicating a lower risk for contracting HIV.	Control: Participants did not receive the AIDS education programme. Outcome measurement: AIDS Initial Assessment Questionnaire conducted at baseline and AIDS Follow-up Questionnaire conducted 6 months later. Follow-up: 6 months.	Number of times participants used new drug paraphernalia or disinfectant (scale range 0 to 40): • treated: mean score 15.8 • control: mean score 18 • p value for comparison: p>0.05 Frequency of injecting in last 6 months (scale range 0 to 64): • treated: mean score 26.2 • control: mean score 26.3 • p value for comparison: p>0.05	population and more willing to volunteer) • method of randomisation not provided • attrition bias: attrition in each of the 2 groups was not presented • blinding: no information on blinding reported • measurement of outcome: all outcomes were self-reported, and the interpretation of mean scores is unclear QCC rating: low
Dolan and others 2003 (1) Primary study was identified from reviews: Durjava and others 2018 (17) Hedrich and others 2011 (18) Larney and others 2010 (19)	Australia, 1997 to 1998	Study design: RCT Participants: N=253 male prisoners who reported injecting drug use and were eligible for participation in methadone treatment (mean age: 27 years, SD: 6 years). Ethnicity not reported. Prison security classification: Available for n=93 (37%) of participants: • minimum: n=30 (32%)	Treated (n=129): Methadone treatment, 30 mg, increased by 5 mg every 3 days until 60 mg was reached immediately for 4 months. Control (n=124): 4 month delay to methadone treatment with guaranteed access to after that period. Outcome measurement: Injecting drug use was measured by hair samples and interviews at baseline and follow-up. HIV and HCV	Incidence of HIV: No incidence of HIV for both treated and control participants throughout the study Incidence of HCV: • treated: n=4 of 32 participants (rate per 100 participant years: 24.3, 95% CI: 7 to 62) • control: n=4 of 35 participants (rate per 100 participant years: 31.7, 95% CI: 9 to 81) • p>0.05 for a difference in incidence of hepatitis C between treated and control participants	Risk of bias: • attrition: attrition in each of the 2 groups was not presented • blinding: no information on blinding reported (specifically injecting drug use) • measurement of outcome: injecting drug use outcomes were self-reported (incidence of HIV

Reference	Country and time period	Setting and participants	Interventions	Relevant outcomes	Risk of bias
Seval and others 2020 (22)		• medium: n=26 (28%) • maximum: n=37 (40%) Statistical methods: Intention to treat model was used to compare the intervention and control group, with Student's t-test used for comparison of continuous data and chi squared test used for categorial data.	incidence was measured by finger prick blood samples at baseline and follow-up. Follow-up: 4 months	Injecting drug use (self-reported): • heroin: ○ treated: injected heroin use decreased (60% at baseline to 32% at follow-up) ○ control: injected heroin use increased (68% at baseline to 74% at follow-up) ○ difference: p=0.05 • injection of any drug: ○ treated: other drug use decreased (64% at baseline to 34% at follow-up) ○ control: other drug use increased (70% at baseline to 76% at follow-up) ○ difference: p<0.001 • syringe sharing: treated: syringe sharing decreased (53% at baseline to 20%) ○ control: syringe sharing increased (45% to 54%) ○ difference: p<0.001	and HCV were objectively measured) QCC rating: medium

Table C.2b. Observational studies

Reference	Country, time period	Study design, setting and participants	Interventions	Relevant outcomes	Quality criteria checklist
Cunningham and others 2017 (9) Primary study was identified from reviews: Palmateer and others 2022 (21) Seval and others 2020 (22)	Australia, 2005 to 2014	Study design: Prospective cohort Participants: N=320 prisoners (72% male, median age: 26 years). Ethnicity not reported. Prison security classification: Not reported Statistical methods: Cox proportional hazard analyses of factors associated with HCV infection. Covariates adjusted for were: • age per 10 years older • female sex	Intervention: Receipt of opioid substitution treatment and use of bleach or other disinfectant to clean equipment. Outcome measurement: Assessment of HCV infection, HCV injecting risk behaviours from structured interviews and blood testing at 6 to 12 month intervals. Follow-up: Median follow-up time per participant was 2.3 years (range 1 to 4.1 years).	• n=197 (62%) participants reported injecting drug use during follow-up HR of HCV infection: • receipt of opioid substitution treatment: 1.27 (95% CI: 0.74 to 2.2, p=0.386) • sharing needles: 1.23 (95% CI: 0.74 to 2.20, p=0.42) • use of bleach to clean injecting equipment (unadjusted): 0.83 (95% CI: 0.43 to 1.61, p=0.586)	Risk of bias: • measurement of self-reported outcome not blinded • outcome: use of bleach for cleaning equipment were self-reported (incidence of HIV and HCV were objectively measured) and injecting drug use outcomes QCC rating: medium

Reference	Country, time period	Study design, setting and participants	Interventions	Relevant outcomes	Quality criteria checklist
		• less than or equal to 10 years of schooling • currently receiving OST • methamphetamine injecting • cocaine injecting • heroin injecting • other opiate injecting • frequency of injecting • syringe sharing			
Dolan and others 2004 (14) Primary study was identified from review: Wright and others 2011 (24)	Russia, between 2000 and 2001	Study design: Cross-sectional Participants: 153 male drug dependent prisoners completed a questionnaire on HIV awareness in 2000 and 124 completed it in 2001 (the study does not report if these are the same prisoners who completed the survey in both years). • Year 2000 survey (demographic information available for n=133): mean age 24 years (range 18 to 30 years) • Year 2001 survey (demographic information available for n=98): mean age 27 years (range 18 to 41 years) Ethnicity was not reported. Prison security classification: Not reported Statistical methods: Student's T-Test used for comparison of continuous data and Chi Squared test used for categorial data.	Intervention: Inmates were trained as peer educators at 3 HIV and blood borne virus education training sessions (15 to 20, exact number per session not provided), which included education on cleaning of injecting equipment and prison tattooing risks. Outcome measurement: Four months after the final peer educator training session, 4 of the 10 prison cell blocks were randomly selected and invited to completed a questionnaire in the year 2000 and then a second questionnaire in the year 2001. Questions included knowledge of HIV transmission, blood borne viruses, tattooing and access to bleach.	Cleaning of injecting equipment: • percentage of participants reported cleaning injecting equipment prior to passing it to someone: ○ year 2000 survey: 56% (n=18) ○ year 2001 survey: 62% (n=13) • percentage of participants reporting cleaning injecting equipment after taking it from someone: ○ year 2000 survey: 61% (n=18) ○ year 2001 survey: 89% (n=9) Tattooing practices: • prevalence of tattooing decreased between the year 2000 and 2001 surveys (42% to 19%, p=0.003) • participants used new needle: ○ year 2000 survey: 23% (n=7 of 31) ○ year 2001 survey: 50% (n=5 of 10) • participants used old needle but cleaned it: ○ year 2000 survey: 16% (n= 5 of 31) • year 2001 survey: 50% (n=5 of 10)	Risk of bias: • selection bias: method of randomly selecting cell blocks to be invited for questionnaires not provided • confounding: no matching or adjustment for basic variables (age, sex, and some measure of deprivation) • blinding: measurement of self-reported outcome not blinded • attrition: attrition between the 2 interviews not discussed (n=35, 26.3% drop out) • measurement of outcome: self-report bias from questionnaires QCC rating: low
Dolan and others 2005 (2) Primary study was identified from reviews	Australia,1998 to 2002	Study design: Prospective cohort study which followed up participants from the Dolan and others 2003 (1) Participants: N=365 adult male prisoners from original RCT (n=341 with methadone	Intervention: Assessment of mortality, HCV and HIV incidence, mortality, and re-incarceration data, including outcomes of participants by time spent in methadone maintenance treatment.	Rate of HCV infection by time spent in methadone maintenance treatment: • not in methadone maintenance treatment (number of events = 23, person years at risk = 107): 22 per 100 person years, (95% CI: 14 to 32)	Risk of bias: • baseline data not fully available to assess selection bias • attrition: 275 out of 341 participants dropped out of their first methadone

Reference	Country, time period	Study design, setting and participants	Interventions	Relevant outcomes	Quality criteria checklist
Underhill and others 2014 (23)		maintenance treatment status known) who reported injecting drug use: • n=291 in prison • n=82 on prison methadone maintenance treatment, n=146 not on methadone maintenance treatment Prison security classification: Not reported for follow-up cohort Statistical methods: Incidence rates per 100 person years and hazard ratios were calculated for mortality, reincarceration and HCV infection. Participants were matched for age and exposure groups (prison and methadone maintenance treatment status). Multivariate analysis was adjusted for age and aboriginality.	Outcome measurement: Records of participants recruited to the original RCT were analysed for mortality, HCV and HIV incidence, mortality, and re-incarceration data, including outcomes of participants by time spent in methadone maintenance treatment. Participants were also re-interviewed (n=201 in prison) and provided new finger prick blood samples (n=219, not specified if collected in prison or community). Follow-up: median: 4.2 years (range: 3.4 to 4.7 years)	• less than 46 days (number of events = 2, person years at risk = 2): 127 per 100 person years, (95% CI: 32 to 509) • between 47 to 146 days (number of events = 6, person years at risk = 6): 97 per 100 person years, (95% CI: 43 to 215) • between 147 to 376 days (number of events = 4, person years at risk 17): 23 per 100 person years, (95% CI: 9 to 62) • more than 377 days (number of events = 4, person years at risk = 51): 8 per 100 person years, (95% CI: 3 to 21) HR for HCV infection compared with no methadone treatment, by time spent in methadone maintenance treatment: • less than 46 days (n=2): 1.6 (95% CI: 0.3 to 9.7, p=0.6) • between 47 to 146 days (n=6): 4.2 (95% CI: 1.4 to 12.6, p=0.01) • between 147 to 376 days (n=4): 1.1 (95% CI: 0.4 to 3.3, p=0.8) • more than 377 days (n=4): 0.4 (95% CI: 0.1 to 1.2, p=0.09)	treatment. Additionally, HCV infection data was limited to those who provided follow-up blood samples QCC rating: medium
Dolan and others 1998 (3) Primary study was identified from reviews: Hedrich and others 2011 (18) Larney and others 2010 (19)	Australia, 1993	Study design: Retrospective cohort Participants: N=187 adults (90% male) who injected drugs and had been in the prison in last 2 years. Three intervention groups were studied: • group 1 (n=105): mean age 30 years (SD: 7 years), 10% aboriginal • group 2 (n=32): mean age 34 years (SD: 7 years), 6% aboriginal • group 3 (n=48): mean age 33 years (SD: 6 years), 13% aboriginal	Intervention: group 1: standard drug addiction care (routine counselling) group 2: time limited methadone (restricted methadone treatment) group 3: methadone maintained (received methadone doses over 60mg for the duration of imprisonment) Outcome measurement: Participants from each group completed a questionnaire which included an HIV risk taking behavioural scale.	Injected in prison: • 31% of group 3 injected in prison compared to 46% of group 1 and 56% of group 2 • comparison of group 3 to group 1 and 2: p>0.05 Heroin injecting: • 15% of group 3 injected heroin compared to 38% of group 1 and 50% of group 2 • difference between group 1 and group 3: p<0.01 • difference between group 2 and group 3: p=0.001	Risk of bias: • confounding: no adjustment for basic variables (age, sex, and some measure of deprivation) • blinding: measurement of exposure and outcome not blinded • measurement of outcome: self-report bias from questionnaires QCC rating: medium

Reference	Country, time period	Study design, setting and participants	Interventions	Relevant outcomes	Quality criteria checklist
		Prison security classification: • group 1 (n=105): 14% maximum security • group 2 (n=32): 35% maximum security • group 3 (n=48): 17% maximum security Statistical methods: Student's T-Test used for comparison of continuous data and chi squared test used for categorial data. Comparison between groups on the HIV risk taking behaviour scale was analysed using the Mann-Whitney test.		Shared syringes: • 21% of group 3 shared syringes compared to 39% of group 1 and 47% of group 2 • difference between group 1 and group 3: p<0.05 • difference between group 2 and group 3: p<0.05)	
Ferrer-Castro and others 2012 (10) Primary study was identified from reviews: Lazarus and others 2018 (20)	Spain, 1999 to 2009	Study design: Cross-sectional Participants: Random sample of n=110 out of 425 male inmates imprisoned in a prison with a needle exchange programme. Ethnicity was not reported. The age groups provided of the n=81 who completed the questionnaire were: • less than 25 years: 6% • 25 to 45 years: 74% • more than 45 years: 20% Prison security classification: Not reported Statistical methods: Chi squared test used for analysis of categorial data with Yates correction.	Intervention: Needle exchange programme Outcome measurement: • injecting drug use behaviours assessed through questionnaires (n=81) and group interviews (participant numbers not reported) after 10 years • prevalence of HCV and HIV was assessed through clinical records (n=362 at baseline and n=425 at 10 year follow-up, demographics not available) Time points analysed: 6 months, 12 months, and 10 years. The number of participants who participated in surveys and interviews at each time point was not reported	Injecting drug use once or more times per day (total numbers not reported): • baseline: 25% • 6 months: 87% • 12 months: 13.3% • 10 years: 9.1% Sharing needles: • baseline: n=25 out of 56 (46%) • 6 months: n=1 out of 26 (4%) • 12 months: n=1 out of 14 (7%) • 10 years: n=18 out of 22 (19%) • there was a decrease in sharing needles at baseline compared to 6 and 12 months later (p<0.01) Prevalence of blood borne infections related to injecting drug use (total numbers not reported): • HCV prevalence: decreased from baseline to follow-up (40% to 26%, p<0.01) • HIV prevalence: decreased from baseline to follow-up (21% to 8.5%, p<0.01)	Risk of bias: • confounding: no matching or adjustment for basic variables (age and some measure of deprivation) • attrition: attrition not discussed at each follow-up point • measurement of outcome: injecting drug use behaviours was self-reported and assessed through unvalidated questionnaires • study limitations: no consideration of result biases and limitations in discussion QCC rating: low

Reference	Country, time period	Study design, setting and participants	Interventions	Relevant outcomes	Quality criteria checklist
Heinemann and others 2001 (11) Primary study identified from reviews: Lazarus and others 2018 (20) Palmateer and others 2022 (21) (This was a review of reviews, Heinemann was discussed specifically in European Centre for Disease Prevention and Control, 2018 (31) Information for this study was taken from the above reviews, as the primary study was not in English language	Germany, April 1996 to July 1997	Study design: Mixed methods (cross-sectional and longitudinal) Participants: Male and female prisoners analysed before (n=128) needle syringe programme implemented in one prison and after implementation (n=338). Cross-sectional study participants: intravenous drug using inmates (questionnaire) n=191 intravenous drug using inmates (interview) n=22 prison employees (questionnaire) n=81 prison employees (interview) n=9 Longitudinal study participants: intravenous drug using inmates n=231 Prison security classification: Not reported Statistical methods: Unclear	Intervention: Needle syringe vending machines for exchange of used needles. Several machines installed in different stations, partly in locations not accessible by staff Outcome measurement: Data was collected from surveys, patient records and blood samples.	HBV, HCV and HIV infection: • one new HIV infection observed in longitudinal study • no new hepatitis infections observed after implementation of needle syringe programme Drug consumption: Increased drug consumption in participants receiving methadone treatment, but it was not reported if this was injecting drug use or other types of drug use. Needle sharing: • participants reported that the frequency of needle sharing was either minimally decreased or unchanged after the intervention	Not possible to access primary study to perform QCC to assess risk of bias Limitations identified from reviews: no specific limitations reported, European Centre for Disease Prevention and Control, 2018 (31) reported as ‘very low’ level of evidence
Kinner and others 2013 (4) Primary study was identified from reviews: Durjava and others 2018 (17)	Australia, between August 2008 and July 2010	Study design: Cross-sectional Participants: N=1,241 adult opioid dependent, injecting drug users (78% male, n=965). Ethnicity and exact age not reported. Prison security classification: Not reported Statistical methods: Logistic regression model including the variables sex, prison jurisdiction and injecting drug use	Intervention: Opioid substitution treatment among 2 Australian prisons with differing opioid substitution treatment availability: Queensland (n=737): • opioid substitution treatment not available for men • opioid substitution treatment available for pregnant women or women incarcerated for less than 12 months New South Wales (n=504): • opioid substitution treatment available for men and women	Injecting drug use: • Queensland: n=286 (39%) • New South Wales: n=211 (42%) • difference: p=0.27	Risk of bias: • baseline data not fully available to assess selection bias • confounding: no adjustment for basic variables (age and some measure of deprivation) • attrition: attrition not discussed • blinding: measurement of self-reported outcome not blinded • exposure not described in detail

Reference	Country, time period	Study design, setting and participants	Interventions	Relevant outcomes	Quality criteria checklist
			Prisoners received either methadone or buprenorphine as opioid substitution treatment. Outcome measurement: Cross-sectional survey which included questions about injecting drug use		• measurement of outcome: self-reported injecting drug use QCC rating: low
Marco and others 2013 (5) Primary study was identified from reviews: Seval and others 2020 (22)	Spain, January 2003 to June 2010	Study design: Retrospective cohort Participants: N=119 adult prisoners from 4 prisons who had achieved sustained virological response following HCV treatment (98% male), mean age 33.4 years, SD 6.3 years. N=114 participants (96%) were Spanish. N=96 (81%) of were injecting drug users, of which N=47 (40%) were in receipt of methadone maintenance treatment for the entire study duration. Prison security classification: Not reported Statistical methods: HCV reinfection rate per 100 person years was calculated for categorical variables including age, sex, HIV status and methadone maintenance treatment. Bivariate and multivariate analysis was undertaken using Cox's proportional hazards model (including age group, sex and whether the participant was born in Spain).	Intervention: Methadone maintenance treatment Outcome measurement: Participants were interviewed every 12 months post achieving sustained virological response on injecting drug use and whether they had remained on methadone maintenance treatment. Blood samples were also taken and tested for HCV. Electronic clinical records were also reviewed for prior and current injecting drug use, HIV status, HCV baseline viral load and HCV reinfection dates. Follow-up: Mean 1.4 years (SD 0.3 years)	• 47 (40%) of the 96 injecting drug users received methadone maintenance treatment for the entire duration of the study period (from treatment onset to evaluation in 2010). Of this sub-group, n=1 participant (11%) experienced HCV re-infection HCV re-infection: • receiving methadone maintenance treatment: Lower incidence, 1.64 per 100 person years • not receiving methadone maintenance treatment: Higher incidence, 7.49 per 100 person years • difference: p=0.25	Risk of bias: • blinding: measurement of outcome (injecting drug use) not blinded • measurement of outcomes: potential self-report bias on injecting drug use QCC rating: medium

Marco and others 2014 (6)
 	
Primary study was identified from reviews:
 	
Seval and others 2020 (22)
	Spain, 1992 to 2012	Study design: Retrospective cohort
		
		Participants:
		N=2377 prisoners (mean age 39.7 years, SD 11 years), of which n=1425 (60%) were white.
		N=168 (7%) participants had a history of injecting drug use.
			Intervention: methadone maintenance treatment
			
			Outcome measurement:
			Repeated routine HCV serological analysis to identify predictive factors of HCV
				HCV incidence:
				• receiving methadone maintenance treatment:
				  ○ HCV infections: n=3 (23%)
				  ○ lower incidence, 1.35 per 100 person years
				• not receiving methadone maintenance treatment:
					Risk of bias:
					• measurement of outcome: records of laboratory analysis was used to calculated HCV infections, but these may have varying detail

Reference	Country, time period	Study design, setting and participants	Interventions	Relevant outcomes	Quality criteria checklist
		Prison security classification: Not reported Statistical methods: HCV incidence was calculated per 100 person years of follow-up. Multivariate analysis and cox regression used (including age group, sex, ethnicity and whether the participant was born in Spain)	Follow-up: Mean 1540.9 days per participant (4.22 years)	○ HCV infections: n=62 (40%) ○ higher incidence, 6.66 per 100 person years • HR: 1.07, 95% CI: 0.33 to 3.46 • difference: p=0.91	between participants or omit information QCC rating: medium
Nelles and others 1998 (15) Primary study was identified from reviews: Lazarus and others 2018 (20)	Switzerland, 1994 to 1995	Study design: Mixed methods Participants: 137 female prisoners who participated in interviews at least once. Age and ethnicity not reported. Prison security classification: Not reported Statistical methods: Unclear	Intervention: Syringe dispensing machines were used to distribute needles and syringes. In addition, participants received lectures, group sessions and sociomedical counselling on risks of injecting drug use and syringe sharing. Outcome measurement: Injecting drug use, syringe sharing, and blood borne virus incidence was measured through interviews, data from prison files and blood testing. Follow-up: • baseline (n=65) • 3 months (n=49) • 6 months (n=33) • 12 months (n=57)	HBV, HCV, HIV incidence: • no incidences of HBV, HCV, or HIV reported at follow-up Injecting drug use: • baseline: 19 incidences (29% of participants interviewed at baseline) • 3 months follow-up: 18 incidences (37% of participants interviewed at 3 months) • 6 months follow-up: 11 incidences (33% of participants interviewed at 6 months) • 12 months follow-up: 9 incidences (16% of participants interviewed at 12 months) Shared syringes: • baseline: 8 incidences (8%) • 3 month follow-up: 5 incidences (10%) • 6 months follow-up: 2 incidences (6%) • 12 months follow-up: 1 incidence (2%)	Risk of bias: • baseline data not fully available to assess selection bias • confounding: no reported adjustment for basic variables (age and some measure of deprivation) • attrition: attrition not discussed • blinding: measurement of self-reported outcome not blinded • exposure not described in detail • measurement of outcome: self-reported injecting drug use • no statistical methods reported QCC rating: low
Stark and others 2005 (12) Primary study was identified from reviews: Lazarus and others 2018 (20)	Germany, October 1998 to June 2001	Study design: Prospective cohort study Participants: N=174 prisoners of 2 separate prisons, one for females (68%) and one for males (32%). Of these, N=166 prisoners who had used illicit drugs (including injected drugs), the median age in this group was 31 years (IQR: 27 to 34). Ethnicity was not	Intervention: female only prison: automatic syringe dispensing machines installed which provided sterile syringes and skin disinfectant pads, located in places not visible to prison staff male only prison: social workers distributed needles and syringes 3	HBV and HIV incidence: • no new infections were reported of HBV or HIV at follow-up • 4 HCV infections at median 12 month follow-up, 1 confirmed to have been acquired in prison Injecting drug use in 6 months prior to imprisonment:	Risk of bias: • confounding: no matching or adjustment for basic variables (age, sex, and some measure of deprivation) • attrition: attrition not discussed

Reference	Country, time period	Study design, setting and participants	Interventions	Relevant outcomes	Quality criteria checklist
		reported in the full cohort or cohort who injected drugs. Prison security classification: Not reported Statistical methods: Chi-squared test used to analyse association between categorical variables. Logistic regression was used for multivariate analysis of determinants for HIV, HBV and HCV infection at baseline.	times a week in one room confidentially Outcome measurement: Interviews and laboratory testing for HBV, HCV and HIV markers were performed at baseline and follow-up visits every 4 months. Follow-up: Median follow-up 12 months (n=124 participants followed up, n=81 females and n=43 males)	baseline: 91% (males and females combined) females: decreased to 67% at median 12 month follow-up males: decreased to 90% at median 12 month follow-up Shared syringes (males and females combined): • baseline: 71% • first follow-up: 11% • second follow-up: 2% • no case of syringe sharing was reported after first and second follow-up	• blinding: measurement of self-reported outcome not blinded • intervention not described in detail and fundamentally different between prisons • measurement of outcome: self-report bias from interviews QCC rating: low
Taylor and others 2012 (7) Primary study was identified from reviews: Seval and others 2020 (22)	Scotland, Between June 2010 and March 2011	Study design: Cross-sectional Participants: N=5076 prisoners from 14 closed prisons (95% male) mean age 32.4 years (SD 10.9 years). Ethnicity not reported N=929 reported receiving opioid substitution treatment at the time of the survey and n=1207 who reported receiving opioid substitution treatment within the last 6 months Prison security classification: Not reported (all closed prisons) Statistical methods: Characteristics of participants were compared using logistic regression both univariably and after mutual adjustment (variables included in model not specified).	Intervention: opioid substitution treatment Outcome measurement: Questionnaires (interview option available to account for literacy problems) and blood testing for HCV seroprevalence.	Injecting drug use in current imprisonment: • receiving OST: 8% • not receiving OST: 7% • OR 1.32 (95% CI: 0.83 to 2.09)	Risk of bias: • confounding: no matching or adjustment for basic variables (age, sex, and some measure of deprivation) • attrition: attrition not discussed • blinding: measurement of self-reported outcome not blinded • measurement of outcome: self-report bias from interviews QCC rating: medium
Teutsch and others 2010 (8) Primary study was identified from reviews:	Australia, September 2005 to May 2009	Study design: Prospective cohort study Participants: n=488 prisoners (mean age 28 years, SD 6.9 years), with history of injecting drug use and a documented negative HCV test within	Intervention: methadone maintenance treatment Outcome measurement: Participants were interviewed about behavioural risk factors for HCV	HCV incidence in participants receiving methadone maintenance treatment: • not receiving methadone maintenance treatment (n=58): ○ incidence rate: 24.6 per 100 person years (95% CI: 18.6 to 31.7)	Risk of bias: • selection bias: recruitment via word of mouth and nurses approaching selected prisoners

Reference	Country, time period	Study design, setting and participants	Interventions	Relevant outcomes	Quality criteria checklist
Durjava and others 2018 (17)		the previous 12 months, from 19 correctional centres (65% male). Ethnicity was not reported in full cohort. n=94 incidences of HCV were analysed (54% male). Of these, 63% were more than 25 years and 37% were aged 18 to 25. Ethnicity of this subgroup was reported as aboriginal (28%) and other (72%) Prison security classification: Not reported Statistical methods: Unadjusted HCV incidence rates were calculated using the person years method with 95% Poisson confidence intervals. The date of HCV infection was adjusted to account for HCV risk factors which may have occurred within compared to outside of prison. Incidence rates were calculated for subgroups including age, sex, ethnicity, injecting drug use (including drug type), needle sharing, and receipt of methadone maintenance treatment. Multivariate logistic regression of the risk factors included the variables previously imprisoned, if they've ever had a tattoo and daily injecting drug use in the 3 months prior to imprisonment and if they were receiving methadone maintenance treatment.	transmission (including injecting behaviours, tattooing, and piercing) over their lifetime, 3 months prior to incarceration and 3 months during incarceration. Blood samples were also collected at enrolment for HCV serological conversion testing	○ rate ratio: 1 • receiving methadone maintenance treatment (n=36): ○ incidence rate: 60.1 per 100 person years (95% CI: 42.1 to 83.2) ○ rate ratio: 2.5 (95% CI: 1.6 to 3.7) • difference: p<0.001 Injecting drug use in participants receiving methadone maintenance treatment: • prisoners receiving methadone maintenance treatment (31 out 99 prisoners, 31%) reported a decreasing pattern of drug use compared to controls, (77 out 391 prisoners, 20%, p=0.01). more self-reported incidences of injecting drug use since imprisonment in prisoners receiving methadone maintenance treatment (35 incidences out of 99 prisoners, 35%) compared to those not receiving treatment (98 out of 391 prisoners, 25%, p=0.04) • no difference in self-reported incidences of injected methadone or buprenorphine in prisoners receiving methadone maintenance treatment (14 incidences out of 99 prisoners, 14%) compared to those not receiving treatment (59 out of 391 prisoners, 15%, p=0.81)	• confounding: no adjustment for age or sex. • attrition: attrition not discussed • blinding: measurement of self-reported outcomes not blinded • measurement of outcome: potential self-report bias from interviews • reporting bias: selectively reported results on injecting drug use in paper with further information and more outcomes available in supplementary file QCC rating: low

Annexe D. Critical appraisal

Table D. Quality criteria checklist

Reference	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Score	Notes
Baxter and others 1991	Yes	No	No	No	No	Yes	No	Yes	Yes	Yes	Low	• Q2: selection bias, participants were primarily women (more women in jail population and more willing to volunteer) • Q3: method of randomisation not provided • Q4: attrition in each of the 2 groups was not presented • Q5: no information on blinding was reported • Q7: measurement of outcome was self reported and questionnaire not validated
Dolan and others 2003	Yes	Yes	Yes	No	No	Yes	No	Yes	Yes	Yes	Medium	• Q4: attrition in each of the 2 groups was not presented • Q5: no information on blinding was reported (injecting drug use) • Q7: measurement of injecting drug use was self-reported
Cunningham and others 2017	Yes	Yes	Yes	Yes	No	No	No	Yes	Yes	Yes	Medium	• Q5: measurement of self-reported outcome not blinded • Q6 and Q7: subjective measurement of exposure and outcome (use of bleach for cleaning equipment and injecting drug use outcomes)
Dolan and others 2005	Yes	No	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Medium	• Q2: baseline data not available to assess selection bias • Q4: attrition not reported
Dolan and others 2004	Yes	No	No	No	No	Yes	No	Yes	Yes	Yes	Low	• Q2: method of randomly selecting cell blocks to be invited to participate in questionnaires was not provided • Q3: confounding (no adjustment for basic variables) • Q4: the study does not clearly report if it is the same group of people completing the survey in both the year 2000 and 2001 • Q5: measurement of self-reported outcome not blinded • Q7: measurement of outcome self-reported and not measured from a validated questionnaire
Dolan and others 1998	Yes	Yes	No	No	No	Yes	No	Yes	No	Yes	Medium	• Q3: confounding (no adjustment for basic variables) • Q4: response rate not discussed • Q5: measurement of self-reported outcome not blinded • Q7: measurement of outcome subject to self-report bias
Ferrer Castro and others 2012	Yes	Yes	No	No	Yes	Yes	No	Yes	No	Yes	Low	• Q3: confounding (no adjustment for basic variables) • Q4: attrition not discussed at each time point • Q7: measurement of outcome (injecting drug use) assessed through unvalidated questionnaires • Q9: study limitations not discussed
Kinner and others 2013	Yes	No	No	No	No	No	No	Yes	Yes	Yes	Low	• Q2: baseline data not available to assess selection bias

Reference	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Score	Notes
												• Q3: confounding: (no adjustment for age and some measure of deprivation) • Q4: attrition not reported • Q5: measurement of self-reported outcome not blinded • Q6: exposure not described in detail • Q7: measurement of outcome self-reported
Marco and others 2013	Yes	Yes	Yes	Yes	No	Yes	No	Yes	Yes	Yes	Medium	• Q5: measurement of injecting drug use not blinded • Q7: measurement of outcome self-reported (injecting drug use)
Marco and others 2014	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Medium	• Q7: measurement of outcome: records of laboratory analysis were used to calculated HCV infections, but these may have varying detail between participants or omit information
Nelles and others 1998	Yes	No	No	No	No	No	No	No	Yes	Yes	Low	• Q2: baseline data not available to assess selection bias • Q3: confounding: (no adjustment for basic variables) • Q4: attrition not reported • Q5: measurement of self-reported outcome not blinded • Q6: exposure not described in detail • Q7: measurement of outcome self-reported • Q8: no statistical analysis details provided
Stark and others 2005	Yes	Yes	No	No	No	No	No	Yes	Yes	Yes	Low	• Q3: confounding (no adjustment for basic variables) • Q4: attrition not reported • Q5: measurement of self-reported outcome not blinded • Q6: intervention not described in detail and fundamentally different between prisons in a way which could impact the outcome • Q7: measurement of outcome subject to self-report bias
Taylor and others 2012	Yes	Yes	No	No	No	Yes	No	Yes	Yes	Yes	Medium	• Q3: confounding (no adjustment for basic variables) • Q4: attrition not reported • Q5: measurement of self-reported outcome not blinded • Q7: measurement of outcome (injecting drug use) was self-reported and not a validated questionnaire (details not provided, only that it was based on other studies)
Teutsch and others 2010	Yes	No	No	No	No	Yes	No	No	Yes	Yes	Low	• Q2: selection bias, recruitment via word of mouth and nurses approaching selected prisoners • Q3: confounding (no adjustment for age or sex) • Q4: attrition not discussed • Q5: measurement of self-reported outcome not blinded • Q7: measurement of outcomes subject to self-report bias • Q8: reporting bias, selective reporting of injecting drug use results

QCC questions

1. Was the research question clearly stated?
2. Was the selection of study subjects or patients free from bias?
3. Were study groups comparable?
4. Was method of handling withdrawals described?
5. Was blinding used to prevent introduction of bias?
6. Were intervention or therapeutic regimens or exposure factor or procedure and any comparisons described in detail? Were intervening factors described?
7. Were outcomes clearly defined and the measurements valid and reliable?
8. Was the statistical analysis appropriate for the study design and type of outcome indicators?
9. Are conclusions supported by results with biases and limitations taken into consideration?
10. Is bias due to study's funding or sponsorship unlikely?

About the UK Health Security Agency

UKHSA is responsible for protecting every member of every community from the impact of infectious diseases, chemical, biological, radiological and nuclear incidents and other health threats. We provide intellectual, scientific and operational leadership at national and local level, as well as on the global stage, to make the nation health secure.

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