A review of the effectiveness and cost-effectiveness of needle and syringe programmes for injecting drug users

Executive Summary

Lisa Jones, Lucy Pickering, Harry Sumnall, Jim McVeigh, Mark A Bellis

Centre for Public Health, Liverpool John Moores University
EXECUTIVE SUMMARY

Background
National estimates suggest that in 2005/06 there were approximately 129,977 injecting opiate and/or crack cocaine users in England. Injecting drug users (IDUs) experience high levels of morbidity and mortality and in 2006 there were 1,469 deaths relating to drug misuse in England including those who died as a result of accidental overdose, intentional self-poisoning and from drug use and drug dependence. Sharing needles and syringes is a key route by which blood borne viruses (BBV) may be transmitted among IDUs, and almost a quarter of IDUs report sharing in the previous four weeks. Sharing injecting equipment such as filters, mixing containers and water is also an important route of infection, particularly in the case of hepatitis C (HCV) and almost half of IDUs have recently shared these types of injecting equipment. HCV is currently the most important infectious disease affecting IDUs, with approximately 40% of IDUs infected. In comparison, HIV prevalence rates are relatively low among IDU populations.

The first needle and syringe exchange programmes (NSPs) were established in the UK in 1985, and since then provision of these services has grown rapidly. Needle exchange services in England are based across a range of services including specialist services, pharmacies, outreach/mobile services, custody suites and A&E departments. However, over 70% of needle exchange services in England are provided by pharmacies. A recent joint report by the Healthcare Commission and the National Treatment Agency for Substance Misuse (NTA) of a three-year review of drug treatment and harm reduction services concluded that generally pharmacy and specialist needle exchanges provided a wide range of harm reduction information and advice. However, the report highlighted that there was a clear national shortfall in the provision of out-of-hours needle exchange, and that vaccination for hepatitis B (HBV), and testing and treatment for hepatitis C was not provided widely enough by local drug treatment partnerships.

Objectives
This review sought to determine the optimal provision of needle exchange schemes among IDUs. The following key research questions were addressed: (1) What level of coverage of needle and syringe programmes (NSPs) is the most effective and cost-effective?; (2) What types of NSPs are effective and cost effective?; (3) Which additional harm-reduction services offered by NSPs are effective and cost effective?;
and (4) Are NSPs delivered in parallel with, or alongside, opiate substitution therapy (OST) effective and cost-effective?

Methods
The methods for the review of effectiveness and cost-effectiveness followed NICE protocols for the development of NICE Public Health Guidance. Fifteen databases were searched for good quality systematic reviews of experimental and observational studies, randomised controlled trials, controlled non-randomised studies, controlled and uncontrolled before and after studies, cross-sectional studies, cohort studies, case-control studies, ecological studies and full economic evaluation studies published since 1990. Two reviewers independently screened all titles and abstracts. Data extraction and quality assessment of individual studies was undertaken independently by one reviewer and checked for accuracy by a second reviewer. Each study was graded (+++, + or -) based on the extent to which the design and execution of the study minimised the potential sources of bias. Results of the data extraction and quality assessment are presented in structured tables and as a narrative summary. Evidence statements were developed based on the narrative summary of the evidence. These evidence statements are presented below and are numbered according to the Section that they refer to within the main body of the report.

Review of effectiveness
The review of effectiveness included a total of 10 systematic reviews and meta-analyses, and 24 primary studies. Although a large number of studies were identified during the review process that had examined the effects of NSPs on risk behaviours and BBV incidence and prevalence among IDUs, few studies addressed the research questions of interest for this review.

Systematic reviews and meta-analyses
The majority of the systematic reviews and meta-analyses identified considered there to be good evidence that NSPs reduce injection risk behaviours among IDUs. However, the evidence was less clear in relation to HIV incidence; whilst two reviews considered there to be good evidence to support the effectiveness of NSPs in reducing HIV incidence, another review concluded that the evidence was less robust. Two reviews considered the impact of NSPs on the prevalence and incidence of HCV,

1 References to the included studies can be found in the Main report
concluding that NSPs have less of an impact on HCV infection than HIV infection. None of the systematic reviews and meta-analyses identified for inclusion in the review directly addressed the research questions of interest.

**Evidence statements**

5.1a. There is evidence from one good quality (++) and five moderate quality (+) systematic reviews and meta-analyses that participation in NSPs reduces injection risk behaviours among IDUs, in particular self-reported sharing of needle and syringes, and frequency of injection. The evidence is not clear in relation to the impact of participation in NSPs on sharing of other injection equipment such as cookers, filters or water because few studies have examined these outcomes.

5.1b. There is evidence from two good quality (++) systematic reviews to support the effectiveness of NSPs in reducing HIV infection among IDUs. However, findings from two other systematic reviews, including one high-quality (++) review, suggest that the evidence may be less convincing. There is insufficient evidence from two systematic reviews to determine the impact of NSPs on HCV infection in IDUs.

5.1c. There is evidence from two good quality (++) systematic reviews to suggest that access to sterile needles and syringes via pharmacies provides specific benefits in addition to those available through specialist NSPs.

**Primary studies**

Twenty-four primary studies were identified that addressed one or more of the four key research questions. One study examined issues related to coverage, 14 studies examined different types of NSPs, seven studies examined additional harm reduction services offered by NSPs, and two studies examined NSPs delivered alongside OST. The findings of the primary research studies identified for inclusion in the reviews are discussed under the four key research questions below.

**Review of cost-effectiveness**

Thirteen full economic evaluations were identified for inclusion, including 12 cost-effectiveness analyses and one cost-benefit analysis. Eleven studies examined reduction in HIV incidence, one study examined HCV incidence and one study examined reductions in both HIV and HCV incidence. All 12 studies that examined the impact of NSPs on HIV infection concluded that NSPs were cost-effective, and
compared to the lifetime costs of HIV/AIDS treatment were cost-saving. Two studies examined the impact of NSPs on HCV infection but drew differing conclusions.

**Evidence Statements**

7.1a. There is evidence from 11 CEAs and one CBA to suggest that in terms of reducing HIV incidence and prevalence among IDUs NSPs are cost-effective.

7.1b. There is evidence from one CEA to suggest that in terms of HCV incidence and prevalence among IDUs NSPs are not cost-effective.

Applicability: Cost and benefit estimates were either based on locally derived data or from studies conducted in North America, and a range of assumptions were made limiting the applicability of the findings beyond individual studies.

**Key research questions**

*Question 1: What level of coverage of needle and syringe programmes (NSPs) is the most effective and cost-effective?*

One cross-sectional study was identified that examined individual syringe coverage among NSP participants in California. Individual syringe coverage was calculated by multiplying the number of monthly NSP visits by the participant by the number of syringes they had retained from the last visit. This was then divided by the number of illicit drug injections they reported in the last thirty days and multiplied by 100 to obtain a percentage. High levels of individual syringe coverage (150% coverage or more) were found to be associated with safer injection risk behaviours. NSP participants who were homeless, reported recent heroin injection or crack cocaine use, or were not in treatment had lower levels of syringe coverage. In a further analysis of this data, NSPs that had less restrictive dispensation policies were found to have more clients with adequate syringe coverage (100% or more); clients of unlimited needs-based distribution and unlimited one-for-one plus exchange had a higher prevalence of adequate syringe coverage compared to clients of more restrictive syringe dispensation models.

Two CEAs examined the cost-effectiveness of increasing the level of coverage of NSPs. One study that considered a hypothetical cohort of IDUs in the USA found that the programme was cost-effective across all levels of coverage and cost-saving compared to HIV treatment costs at levels of coverage up to 88.4%. A second study
examined the effects of scaling up harm reduction activities for IDU in a population with high HIV prevalence in the Ukraine. The results of the model suggested that increasing intervention coverage to the 60% target recommended by WHO/UNAIDS resulted in reductions in both HIV incidence and prevalence and that the additional resources required to achieve this level of coverage represented a ‘worthwhile use of resources’. One CEA that sought to determine the optimal allocation of resources within a multi-site needle exchange programme found that cost-effective allocation within a multi-site NSP required that sites were located where the density of IDUs was highest and that the number of syringes exchanged per client was equal across sites. By way of an example, the author reported that a multi-site programme in Philadelphia, USA, could spend the same budget more effectively by equalising the number of syringes exchanged per client, which could be achieved by increasing operating hours across the sites, in particular at sites in areas of the city with a high density of IDUs.

Further modelling studies have suggested that there are critical coverage thresholds for syringe distribution that need to be reached to substantially reduce HIV prevalence among IDU populations. For example, to reduce the HIV prevalence in London to less than 1%, the coverage of syringe distribution would need to increase to 27%.

**Evidence statements**

6.1a. There is evidence from one poor quality (-) cross-sectional study to suggest that higher syringe coverage is associated with lower levels of injection risk behaviours among IDUs who participated in NSPs, including sharing needles and syringes, sharing cookers and syringe re-use.

6.1b. There is evidence from one poor quality (-) cross-sectional study to suggest that IDUs who were homeless, reported recent heroin injection or crack cocaine use, or were not in treatment had lower levels of syringe coverage.

Applicability: As this study was conducted in the USA, it is unclear whether the findings are applicable to the UK given the differences in the political acceptance of NSPs and wider harm reduction services for IDUs. However, the concept of coverage is applicable in terms of NSP provision in the UK.

7.1b. There is evidence from two CEAs to suggest that intervention coverage may be increased to higher levels at a low cost per HIV infection averted.

7.1c. There is evidence from one CEA to suggest that cost-effective allocation within
a multi-site NSP requires that sites are located where the density of IDUs is highest and that the number of syringes exchanged per client is equal across sites.

Applicability: Cost and benefit estimates were either based on locally derived data or from studies conducted in North America, and a range of assumptions were made limiting the applicability of the findings beyond the individual studies.

**Question 2: What types of NSPs are effective and cost effective?**

Few studies examined how different types of approaches to the distribution of injecting equipment impact on effectiveness and cost-effectiveness. However, based on the literature identified we were able to examine effectiveness across the following areas: 1) accessibility of NSPs based on studies of geographical proximity; 2) distribution of injecting equipment in different settings including community site, pharmacies, hospitals, vending machines and prisons; and 3) different polices on the return and distribution of needles and syringes (e.g. one-for-one exchange). In addition, one CEA was identified that sought to determine the optimal allocation of resources within a multi-site needle exchange programme.

Two cross-sectional studies that examined the impact of geographical proximity to NSPs found that IDUs living in close proximity to NSPs were more likely to utilise NSP services and report lower levels of injection risk behaviours.

Eight studies were identified which examined a variety of outcomes among IDUs depending on their main source of needles. Two RCTs, one that compared pharmacy sales only with NSP exchange plus pharmacy sales and one that compared a hospital and a community-based NSP reported no effect of setting on injection risk behaviours. However, participants who attended a hospital-based NSP had improved access to inpatient and outpatient services compared to those attending a community-based NSP. Findings from six observational studies were inconsistent and difficult to interpret, but three studies demonstrated that mobile van sites and vending machines attracted younger IDU and IDUs with higher risk profiles. Two uncontrolled before and after studies were identified that examined the role of needle exchange in prisons. The needle exchange intervention consisted of a vending machine in two evaluations and in a third evaluation social workers from a non-governmental organisation exchanged sterile syringes and equipment. Reductions in syringe sharing and HIV incidence were found.
Three cross-sectional studies examined the impact of different syringe dispensation policies on injection risk behaviours among IDUs. These studies found that syringe dispensation policies had a limited impact on behavioural outcomes such as sharing but had some impact on syringe re-use.

### Evidence statements

#### Availability and accessibility

6.2a. There is evidence from two poor quality (-) cross-sectional studies to tentatively suggest that close proximity to NSPs can lead to greater utilisation of NSP facilities, resulting in reduced syringe sharing.

Applicability: Both studies were conducted in the USA and it is unclear whether the findings are applicable to the UK given the differences in the political acceptance of NSPs and wider harm reduction services for IDUs.

#### Setting

6.2b. There is evidence from two RCTs, one good quality (++) and one moderate quality (+), to suggest that NSP setting does not impact on injection risk behaviours. The evidence from six poor quality (-) observational studies is inconsistent; however there is evidence from three poor quality cross-sectional studies that mobile van sites and vending machines may attract younger IDUs and IDUs with higher risk profiles.

Applicability: As all of these studies were conducted in countries where the pharmacy sale of needles to IDUs predominated (i.e. USA, Russia and France), rather than free distribution as is the norm in the UK, it is unclear whether the findings are applicable to the UK given the differences in the political acceptance of NSPs and wider harm reduction services for IDUs.

6.2c. There is evidence from one good quality (++) RCT to suggest that providing hospital-based NSP services may increase accessibility to outpatient services among IDUs attending NSPs.

Applicability: As this study was conducted in the USA, it is unclear whether the findings are applicable to the UK given the differences in the political acceptance of NSPs and wider harm reduction services for IDUs. However, as NSPs are available in A&E departments in some areas of the UK this finding may be applicable to NSP provision in the UK.
**Syringe dispensation policy**

6.2d. There is evidence from one moderate quality (+) and two poor quality (-) cross-sectional studies to suggest that syringe dispensation policies have a limited impact on behavioural outcomes such as sharing but some impact on syringe re-use.

Applicability: As all three studies were conducted in the USA, it is unclear whether the findings are applicable to the UK given the differences in the political acceptance of NSPs and wider harm reduction services for IDUs. In addition, the majority of needle exchange services in the UK do not place limits on the amount of equipment exchanged.

**Prison-based NSPs**

5.1d. There is evidence from one moderate quality (+) systematic review that prison-based syringe exchange may be feasible in small prisons, but there is insufficient evidence to determine the effectiveness of these programmes on a larger scale.

6.2e. There is limited evidence from two poor quality (-) uncontrolled before and after studies to tentatively suggest that the provision of vending machines in prisons does not have adverse effects on HIV and HCV seroconversion and reduces syringe sharing and other injection risk behaviours.

Applicability: Both uncontrolled before and after studies were conducted in Europe, however, these findings are currently of limited applicability to the UK because of the political and ethical issues surrounding prison-based NSPs.

---

**Question 3: Which additional harm-reduction services offered by NSPs are effective and cost effective?**

Few studies were identified that directly examined the effectiveness of additional harm reduction services offered by NSPs. However, it was clear from the literature that few NSP services only distributed sterile needles and syringes, in fact the large majority were linked into wider HIV prevention services including outreach, distribution of harm reduction materials and counselling and testing.

Seven studies were identified that addressed the provision of additional services offered by NSPs beyond needle and syringe exchange, two RCTs examined
interventions to encourage IDUs into drug treatment, and one cohort study compared users and non-users of NSP-based health care services. Strength-based case management was found to support drug treatment entry among IDUs who were seeking treatment. However, the primary outcome reported was based on IDUs entering into treatment within seven days, and therefore the impact of the intervention on treatment retention was not clear. A second RCT found that motivational interviewing (MI) had no impact on the treatment interest and enrolment of NSP participants. One cohort study examined the provision of a range of health care services delivered alongside an NSP and found that emergency department use among IDUs who utilised these services was lower than among those who did not.

Four studies examined secondary distribution of needles and syringes to IDUs. Two studies found that IDUs who exclusively obtained their needles from NSPs were less likely to engage in high risk injection behaviours than those who obtained them via secondary distribution. However these studies also found that IDUs who obtained needles via secondary distribution engaged in high risk injection behaviours less than IDU who obtained no needles directly or indirectly from NSPs.

None of the economic evaluation studies identified examined the cost-effectiveness of additional harm reduction services offered by NSPs.
Evidence statements

6.3a. There is evidence from one poor quality (-) RCT to suggest that strength-based case management delivered via NSPs may support drug treatment entry among clients who request drug treatment. There is evidence from one poor quality (-) RCT to suggest that MI has no impact on the treatment interest and enrolment of NSP participants.

6.3b. There is evidence from one moderate (+) quality cohort study to suggest that the provision of NSP-based health care services may decrease emergency department utilisation.

Applicability: As all these study were conducted in the USA, it is unclear whether the findings are applicable to the UK given the differences in the political acceptance of NSPs and wider harm reduction services for IDUs. In addition, differences in the funding of drug treatment services between the UK and USA limit the applicability of these findings.

6.3c. There is evidence from one moderate quality (+) cohort study and one poor quality (-) cross-sectional study to suggest that IDUs who exclusively obtain their needles from NSPs are less likely to engage in high risk injection behaviours than those who obtain them via secondary distribution. However, there is evidence from two poor quality (-) cross-sectional studies to suggest that IDUs who obtain needles via secondary distribution engage in high risk injection behaviours less than IDU who do not obtain any needles, directly or indirectly, from NSPs.

Applicability: As all these study were conducted in the USA, it is unclear whether the findings are applicable to the UK given the differences in the political acceptance of NSPs and wider harm reduction services for IDUs. In addition, the majority of needle exchange services in the UK do not place limits on the amount of equipment exchanged, but there is little consistency regarding service providers’ attitudes towards secondary distribution (NTA 2007).

Question 4: Are NSPs delivered in parallel with, or alongside, opiate substitution therapy (OST) effective and cost-effective?

Two studies were identified that examined needle and syringe distribution delivered in parallel to, or alongside OST. One study assessed the effects of enrolment in two low-threshold methadone maintenance treatment (MMT) programmes delivered via
NSPs. At six-month follow-up, the proportion of participants who were injecting drugs, sharing needles, sharing drug equipment and indirectly sharing (e.g. frontloading and backloading) had declined significantly over the whole cohort. However, within a subgroup of participants who continued to inject during follow-up, only the sharing of injection equipment declined significantly. The second study examined the impact of different levels of harm reduction on HIV and HCV incidence in a cohort of drug users in Amsterdam. A comprehensive programme of harm reduction, which the authors defined as adequate methadone therapy (≥60mg) and full participation in NSP, contributed substantially to the reduction of the incidence of HIV and HCV among drug users in Amsterdam. However, a statistically significant effect was not seen when either intervention was considered separately.

None of the economic evaluation studies identified examined the cost-effectiveness of NSPs delivered in parallel with, or alongside, OST.

**Evidence statements**

6.4a. There is evidence from one poor quality (-) uncontrolled before and after study to suggest that participation in low-threshold MMT programmes delivered by NSPs can reduce injection risk behaviours among drug users.

Applicability: This study was conducted in Canada and given the broad similarities in approaches to harm reduction between the UK and Canada, this finding is likely to have good applicability to the UK.

6.4b. There is evidence from one moderate quality (+) cohort study to suggest that the combination of methadone treatment and full participation in NSPs reduces the incidence of HIV and HCV among drug users.

Applicability: This study was conducted in the Netherlands and given the similarities in approaches to harm reduction between the UK and the Netherlands this finding has good applicability to the UK.
Conclusions

There is a paucity of evidence with regards to the optimal provision of NSPs and it is therefore difficult to draw conclusions on ‘what works best’ within the range of harm reduction services available to IDUs. However, it is apparent from the literature that the distribution of sterile needles and syringes alone is not sufficient to reduce the transmission of BBVs among IDUs, especially the transmission of HCV. Programmes that deliver a comprehensive range of harm reduction services and which are easily accessible to IDUs may prove to be effective and cost-effective but further high quality research is urgently required.