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▶ Estimating the cost-effectiveness of needle-syringe programs in Australia.

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Latest mathematical model from Australia probably broadly applicable also to the UK suggests that needle and syringe programmes have cost-effectively saved/improved lives, and in the long run save the health service money due to averted HIV and hepatitis C infections. But in both countries adequately curbing hepatitis C requires much more.

Summary Australia introduced needle and syringe distribution programmes in 1986, offering sterile injecting equipment to injectors to prevent the spread of infection (mainly HIV and hepatitis; of the latter, hepatitis C is the variant of the greatest concern) due to the sharing of used equipment. HIV prevalence among injectors in Australia has since remained relatively low and stable at about 1%, but hepatitis C prevalence has remained at 50–70%. At present, there are over 3000 needle and syringe distribution programmes across Australia. Based on a mathematical model, this study aimed to estimate the degree to which these programmes have averted HIV and hepatitis C infections, resultant savings in health care costs, and how much the programmes cost per year they extended life, adjusted for the quality of those years (QALYs) – in other words, whether they represented a good investment in health terms.

To do this it was necessary to estimate what would have happened had there been *no* needle and syringe distribution programmes, and to contrast this with estimates derived from what has actually happened. In these calculations a key variable was the extent to which injectors risked becoming infected by using injecting equipment previously used by someone else – the rate of 'receptive sharing'. Reducing this rate was assumed to be the main way needle and syringe distribution programmes curb infection.

Main findings

Nationally in Australia during 2000–2010, the proportions of injectors who in surveys said they had re-used syringes/needles after another injector in the past month varied between 15% and 17%. These represent rates in the presence of a substantial needle and syringe distribution programme. Based on data from the 1970s and 1980s, without any or with few such programmes the sharing rate was 70–90%. It was assumed that by 2000–2010 increased awareness of blood-borne infections would have reduced this to 25–50% even without equipment distribution programmes.

When these figures were fed in to the mathematical model, resultant estimates for 2000–2010 with current needle and syringe distribution programmes were close to actual figures, for example, estimating that proportion of injectors infected with HIV would remain low, reaching 1.1% in 2010, while for hepatitis C the proportion would vary between 50% and 60%.

Without needle and syringe distribution programmes, the model estimated that both HIV and hepatitis C infection would have been substantially more common, reaching prevalence levels among injectors of 1.2–1.5% and 66–80% respectively. The higher estimates are based on the assumption that the sharing rate before needle and syringe provision programmes was 25%, the lower estimates that it was 50%. This means that distribution programmes prevented 192–873 cases of HIV infection (34–70% of what would have been the total) and 19,000–77,000 hepatitis C infections (15–43% of what would have been the total).

Due to people who would otherwise have been infected living longer and staying healthier, during these years preventing these infections would have resulted in a gain of 20,000–66,000 years of life adjusted for the quality of those years (QALYs). Over the lifetime of the same people, a further 48,000–145,000 QALYs would have been gained.

In 2000–2010 needle and syringe distribution programmes cost about 245 million Australian dollars. Without them more people would have had to have been treated for HIV and hepatitis C infections and for consequent illnesses including AIDS and liver disease. The result would have been an extra 70–220 million dollars of health care spending during these years and a further 340–950 million over the lifetime of those infected. Including the cost of the programmes themselves, this means that in 2000–2010 needle and syringe distribution programmes saved one year of life adjusted for quality at a total cost to the health service of from 416 to 8750 dollars, well within the 50,000 dollars commonly accepted in Australia as the maximum for a health intervention to be considered cost-effective. Cumulative costs savings over the life of the injectors who would otherwise have been infected means that by year 2032 the programmes would have saved more than they cost. Eventually each dollar spent on these programmes in 2000–2010 would have saved from 1.3 to 5.5 times as much in averted healthcare costs.

The authors' conclusions

Incorporating available biological, behavioural, and programme data in to a mathematical model suggested that needle and syringe distribution programmes are likely to have averted a substantial number of HIV and hepatitis C infections among drug injectors, and that because of this they cost-effectively save and improve lives in the short-term, and save total healthcare costs over the longer term. These calculations do not include other possible programme benefits such as preventing injecting-related injuries, psychosocial

support, and referral to medical, treatment and other services.

Distribution programmes have helped keep the level of HIV infection among injectors very low, but hepatitis C remains widespread, probably due to its greater transmissibility and the fact that it was already common before the programmes were introduced. Despite programmes reaching a high proportion of injectors in Australia, sharing of injecting equipment remains common among new injectors and is strongly associated with an increased risk of becoming infected with hepatitis C.

The most crucial component of the analysis was the assumption that sharing rates would have been considerably higher without needle and syringe distribution programmes. Additional to the 70−90% rate recorded in pre-programme studies, studies internationally support this assumption. For example, in Canada the sharing rate increased from 10% to 23% following closure of the only fixed needle and syringe distribution programme in the city of Victoria, but was unchanged in Vancouver, where the programme remained open.

Other types of programmes and notably the prescribing of drugs to substitute for illegal opiate-type drugs can also curb infections, but the latter's potential impact depends on the proportion of injectors who inject these types of drugs − in Australia, only about 30%.

FINDINGS With similar policies, services, drug use patterns and rates of HIV and hepatitis C infection, the results of this simulation study part-funded by the Australian government are likely to be broadly applicable to Britain. The credible implication is that in both countries needle and syringe programmes have cost-effectively saved/improved lives, and in the long run will save the health service money due to averted HIV and hepatitis C infections. From this it follows that at least sustaining these programmes is a prudent cost- and life-saving measure.

However, the featured simulation had to make some bold assumptions to complete its calculations. Top among these is, as the authors acknowledge, the assumption that without needle and syringe programmes the proportion of injectors who regularly (implied by the short one-month recall period) re-used this equipment after another injector would have been from 50% to over three times higher, and that such sharing would have remained the norm throughout 2000−2010.

Seemingly contrary to this assumption is the data they present which shows that nationally in Australia the number of syringes distributed per injector has varied over threefold from about 50 to about 180 without any noticeable trend in the associated sharing rate. Effectively the analysts extrapolated this rate back to a hypothetical near 0 number of syringes per injector, and assumed that once coverage is this low the sharing rate would possibly triple. Why this would happen when a threefold variation further up the syringe distribution scale appeared to make little difference is unclear. Another complicating factor is the 'heroin drought' which disrupted drug use patterns in Australia from the end of year 2000. This means the key comparison of sharing rates in the 1970s and 1980s with those in the 2000s straddles a disjunction which brought other important influences in to play apart from needle and syringe distribution programmes.

For the featured simulation needle and syringe provision works by reducing the proportion of injectors who re-use syringes/needles after another injector. An alternative assumption made in an earlier paper from the same research team is that they work (or

at least, having more of them providing more equipment works) by cutting the number of times each set of equipment gets re-used − effectively, the number of bodies a set of equipment has been in and out of before a given injector uses it. Epidemics of infection will be sustained if on average each infected injector results in the infection of at least one other injector. According to this earlier paper, reaching this point would require a post-infection injecting career of nearly 12 year for HIV but just over two years for hepatitis C. Achieving the former is within reach of current services, but the latter is well beyond their capacity to shorten addiction careers.

The challenge of hepatitis C

The resilience of hepatitis C in the face even of substantial intervention resources was also one conclusion of a modelling exercise for the UK, based on a study which collated UK evidence to reach the conclusion that consistent participation in methadone maintenance treatment plus adequate access to fresh injecting equipment (enough for a sterile set for each injection) has prevented many hepatitis C infections.

After adjusting for important influences on the risk of infection, the study found that access to either type of service had approximately halved the risk of infection, and the combination of both could reduce risk by up to 80%. Like the featured analysis, the model used this and other data to extrapolate back to a hypothetical zero access to substitute prescribing and adequate needle exchange, leading to an estimate that current service provision levels may have reduced what would have been a 65% infection rate among injectors to 40%. But making further substantial progress would, the simulation calculated, require scaling up these interventions so that both reach not half the injectors in the UK, but at least 8 in 10. To do this would probably require both considerably more injectors to start using these programmes and for them to stay considerably longer.

Though in line with other findings, this conclusion rests on studies which were unable to eliminate other possible influences on whether someone became infected with hepatitis C. Conceivably, for example, injectors concerned and stable enough to stay in treatment and make regular use of needle exchanges would have found other ways to avoid infection, even if exchanges and treatment were unavailable. However, the study does give an indication of the magnitude of the challenge of controlling hepatitis C.

For more on the challenge of hepatitis C see this series of Findings reviews which stress that the best way to curb the spread of HIV and hepatitis C among injectors is high coverage supply of injecting equipment, enough and sufficiently easily available for a fresh set to be used each time.

Aim for a fresh set of equipment for each injection

The type of models exemplified by the featured analysis make estimates based on what *ought* to happen given current knowledge and best guesses, rather than what has *actually* happened. They have large margins for error in themselves, and also because what they predict may not happen in reality. Also they form a limited basis for determining health policy because they do not extend to estimating whether spending on syringe distribution programmes might save/improve more lives if used in another health sector entirely. However, within the limited remit of preventing infections among injectors, these programmes take pride of place alongside (when opiate-type drugs account for a major part of injecting) opiate substitute prescribing treatment.

Despite the uncertainties, their results and those of other studies were enough to convince Britain's National Institute for Health and Clinical Excellence (NICE) that commissioners should aim to provide every injector with the equipment they need to use a sterile set each time. The NICE committee reached these conclusions partly on the basis of a cost-effectiveness analysis. Like the featured analysis, it concluded that extending adequate needle exchange to a higher proportion of injectors would usually save and improve lives at well below the cost to the health service normally considered worth the expenditure. This work also suggested that while increasing the coverage of syringe distribution and the recruitment rate in to substitute prescribing programmes are sufficient to control HIV, they will not substantially reduce the prevalence or incidence of hepatitis C infection. According to the committee, this requires multi-faceted interventions − not just more needle exchange and prescribing but also, for example, more widespread treatment of hepatitis C infection.

However, complete coverage in terms of the supply of injecting equipment is very far from the norm in Britain, with the result that at the end of the first decade of the 2000s hepatitis C was spreading more rapidly than in in the early 2000s, infecting a quarter of injectors within three years of their starting to inject.

Given funding constraints and the current policy emphasis on recovery from addiction and abstinence rather than harm reduction, it may be unrealistic to expect a further major contribution to stemming the hepatitis C epidemic from services intended to ameliorate the damage from continued injecting. What would help is if their workload could be reduced because (aided or not by treatment) drug users themselves turn away from injecting, by far the most important route for infection. From population estimates and trends in the treatment caseload, it seems this may be happening, an estimated 137,000 injecting drug users in England in 2004−05 falling to 117,000 in 2006−07.

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