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▶ Can needle and syringe programmes and opiate substitution therapy achieve substantial reductions in hepatitis C virus prevalence?

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Among the messages of this simulation model for the UK and other countries is the resilience of hepatitis C in the face of considerable investment in methadone and needle exchange services, that these have nevertheless helped and need to be maintained and if possible expanded, but also that further measures are required to substantially curtail the virus.

Summary A simulation model for the UK and other countries was used to estimate the impact on the spread of hepatitis C virus of scaling-up opiate substitution therapy and high coverage needle and syringe programmes.

Data which fed in to the simulation derived from a synthesis of results from UK studies published since the year 2000 which related use of these services to hepatitis C infection among injectors outside prison. Six studies were found. Two directly assessed the incidence of new infections by retesting injectors a year later. The other four took measurements at a single point in time, but used a laboratory test to identify which injectors were relatively newly infected. In the repeat-test studies, injectors were considered to have been in opiate substitution treatment if this occupied at least six of the 12 months of the follow-up period. For the remaining studies the definition was being in treatment at the time of the test for infection. Injectors were considered to be 'highly covered' by needle and syringe programmes if these had supplied them at least enough injecting equipment to have used a fresh set for each injection.

The conclusion was that when injectors were protected by one or other type of service to the degree set by the synthesis study, the chances of their becoming infected were

halved relative to the risk faced by injectors who had not adequately participated in either type of service. When injectors were protected by both, their risk of infection was just a fifth of that faced by injectors who had used neither to the degree set by the study, and this time the risk reduction was statistically significant.

These values were incorporated in the featured simulation study as the risk reduction effect of being in substitute prescribing and/or receiving enough sterile equipment for each injection in the past month. Data from GPs supported the assumption that on average patients stayed in treatment for eight months. In the absence of adequate data, the same assumption was made for high-coverage needle and syringe provision. The simulation was run for the UK specifically and for countries in general, varying the proportion of injectors engaged in either or both types of programmes. At issue was the effect of increasing these proportions, simulating the impact of scaling up service provision.

Main findings

The all-countries simulation assumed a baseline of no injectors receiving either type of service, and either 20%, 40% or 60% chronically infected with hepatitis C. As long as sustained for at least 15 years, recruiting 6 in 10 injectors in to adequate injecting equipment provision and substitute prescribing treatment was calculated to reduce the proportion infected with hepatitis C by a third. If just 4 in 10 were recruited, this degree of reduction would take 20 years. In the short-term the starting proportion infected made little difference, but over 20 years the interventions had less impact if introduced when a very high proportion of injectors were already infected. Varying assumptions about the effectiveness of the interventions was calculated to make a big difference to their impacts on the epidemics.

For the UK, data supported the assumed baseline of 40% of injectors chronically infected with hepatitis C and half of all injectors engaged in either opiate substitute prescribing programmes or high-coverage needle and syringe provision. The simulation extrapolated back to a hypothetical zero access to substitute prescribing and adequate needle exchange, leading to an estimate that assumed current service coverage of 50% may have reduced what would have been a 65% infection rate among injectors to 40%.

It was calculated that over the long term, recruiting just another 10% (up from 50% to 60%) of UK injectors to these programmes would result in modest further reductions in infection rate, but that substantial progress would require scaling up these interventions so that both reach not half the injectors, but at least 8 in 10. This level sustained for 10 years meant the infection rate would drop from 40% to 30%, and for 20 years, to about 20%. Achieving increased coverage means recruiting more injectors to these programmes and/or retaining those who do use them for longer. Without increased retention, the recruitment rate has to be much higher. For example, at eight months retention, to get 8 in 10 injectors in to these programmes requires over half those not yet attending to join each month. If retention doubles to 16 months, then just under 30% need to join each month – still over twice the assumed 12.5% baseline, but a more achievable figure.

Again, varying assumptions about the effectiveness of the interventions was calculated to make a big difference to their impacts on the infection rate. Even more influential was varying assumptions about what proportion of injectors stop injecting each year from 5%

up to 20%; interventions have greater impact the shorter the typical injecting career.

The authors' conclusions

This analysis suggests that opiate substitution therapy and high coverage needle and syringe programmes can reduce the prevalence of hepatitis C among injectors, but also that reductions are frequently modest and require many years of sustained intervention coverage. For instance, cutting prevalence by a third over 10 years would usually require over 60% of injectors to be engaged in these programmes. Projections for countries which already have sustained high coverage (such as the UK and Australia) suggest that many infections have been averted. For example, without such interventions 65% of UK injectors would have been chronically infected with hepatitis C, amounting to 50,000 extra infections in England and Wales. But further substantial reductions (down by over half) are unlikely unless both interventions can be scaled-up to reach not 50%, but over 80% of injectors for at least 20 years.

In the face of inadequate progress in curtailing hepatitis C, broadly one may recommend extending existing interventions to more injectors, or argue that this will not be enough and other interventions are required. Among these may be vaccination if this becomes available, treating infection, promoting ways to take drugs other than injecting, or distributing less transmission-prone equipment such as low dead space syringes.

Where conventional substitute and equipment supply programmes already reach a high proportion of injectors, the featured simulation suggests that additional alternative measures are indeed required to make substantial further progress. Only a very ambitious programme, for example recruiting 30% of injectors per month to these interventions and typically retaining them for 16 months, would see hepatitis C prevalence in nations such as the United Kingdom halved within 20 years. Such an expansion is unlikely to be sustained or funded. In contrast, where substitute prescribing and equipment supply programmes currently reach few injectors, initial efforts should focus on scaling up both interventions. In the long term, however, even in these areas other interventions such as treating infected patients will also be needed to substantially reduce the prevalence of hepatitis C.

FINDINGS The simulation illustrates why a country such as the UK which started with a high level of hepatitis C infection still has high levels despite considerable investment in needle exchange and methadone and buprenorphine maintenance. Without this investment, tens of thousands more people would have had their lives blighted by infection, but reducing this number by much more still would require a degree of commitment on the part both of injectors and health service funders which seems unlikely.

Sustaining and if possible increasing engagement in needle exchange and methadone and buprenorphine maintenance programmes is essential not just to contain hepatitis C, but also HIV, and for reasons not to do with infection control at all, but more will be needed. One clue to what comes from the study's finding that decreasing the length of injecting careers – which in itself would reduce the number of infections – also augments the impact of the interventions. If recovery-oriented national polices in Britain do work, the result should indeed be to curtail drug use and injecting careers. It has also recently become apparent that injecting is falling out of favour, another way in which infection

could be reduced and service coverage increased without extra resources. These comments are expanded on below.

Sophisticated as they are, the calculations made by the featured analysis depend on an association between infection rates and adequate needle exchange and substitute prescribing which could have been due to other factors. Conceivably, for example, injectors concerned and stable enough to stay in treatment and to make regular use of needle exchanges would have found other ways to avoid infection, even if exchanges and treatment were unavailable. In this scenario, it would not be the services which were active ingredients, but the characteristics of the injectors who tended to use them most. It should also be remembered that one half of the intervention duo modelled in the study − opiate substitute prescribing − is applicable only to patients addicted to these types of drugs. If sustained over many years, injecting crack increased the infection rate in the featured model, and the more primary crack injectors there are, the lower the proportion of injectors who might be attracted in to, accepted by, and retained by opiate substitute prescribing programmes.

High coverage is the key but can it be achieved?

An important finding from the study is that the effectiveness of maintenance and needle exchange in preventing infection is a major influence on how many injectors become infected. Not just sustaining and extending but also optimising both services is important. As emphasised by Findings in a series of reviews on hepatitis C and needle exchange, this and other bodies of work 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, allied with high coverage substitute prescribing.

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 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 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.

NICE's verdict and other studies

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 and prescribing 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, especially when opiate-type drugs account for a major part of injecting.

Despite the uncertainties, the results of such simulations, and those of studies of what actually happens, were enough to convince Britain's National Institute for Health and Clinical Excellence (NICE) that commissioners should aim to provide every injector with all the equipment they need to use a sterile set each time, the definition of high coverage in the featured analysis. The NICE committee reached these conclusions partly on the basis of a cost-effectiveness 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 to justify the expenditure. Also like the featured analysis, this work suggested that while increasing the coverage of syringe distribution and substitute prescribing programmes is sufficient to control HIV, it will not on its own substantially reduce hepatitis C infection; this requires a multi-faceted programme, including for example these interventions plus treatment of patients already infected with hepatitis C.

The featured study's results for Britain are likely to be broadly applicable to countries such as Australia with similar policies, services, drug use patterns and rates of HIV and hepatitis C infection, and vice versa. As in the featured analysis for Britain and hepatitis C, a recent simulation for Australia estimated that without needle and syringe distribution programmes, in 2000–2010 there would have been many more HIV and hepatitis C infections. Distribution programmes had it was calculated prevented 192–873 HIV infections (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).

Unlike the featured analysis, the Australian study went on to estimate that needle and syringe distribution programmes were a highly cost-effective way to extend and improve lives by preventing infection-related illnesses including AIDS and liver disease. Also, cumulative costs savings over the life of injectors who would otherwise have been infected was estimated to mean that 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.

Turning to opioid substitute prescribing, a systematic review of its impact on HIV concluded that this treatment reduces drug-related behaviours with a high risk of HIV transmission. Four studies assessed relationships between the proportions of people who actually became HIV positive (seroconversion) and their participation in methadone treatment. All found that participation as such, or more extended or continuous participation, was associated with a lower rate of seroconversion. However, impacts on hepatitis C are much less well established.

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