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▶ Economic evaluation of delivering hepatitis B vaccine to injection drug users.

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US figures show that testing needle exchange users for hepatitis B and at the same time starting a short course of vaccinations (the UK model) saves lives and thousands of health service dollars, but UK exchanges have lagged behind in offering these services.

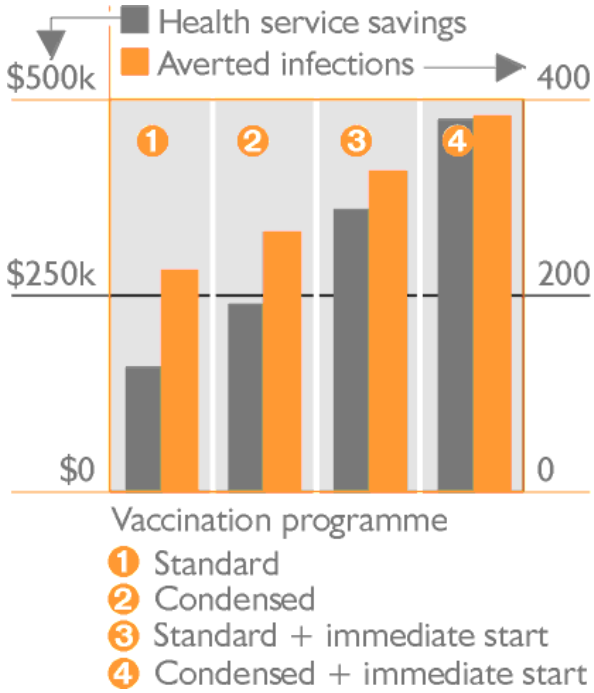
Abstract People who inject drugs are at high risk of hepatitis B infection, yet among this group, hepatitis B vaccination coverage is low. Recent studies have shown that that needle exchange programmes are effective venues to reach and immunise injectors. The purpose of this paper was to determine if targeting injectors for hepatitis B vaccination through syringe exchange programmes is economically desirable for the healthcare system, and to assess the relative effectiveness of four vaccination strategies.

Through syringe exchange programmes in the US cities of Chicago, Hartford and Bridgeport, the study recruited 1964 currently injecting drug users and conducted blood tests to screen for those at risk of hepatitis B infection. Of the 860 susceptible to the disease, 595 returned to receive their first doses of vaccine. They were randomly allocated either to a condensed vaccination schedule (initial dose plus doses one and two months later) or to the longer standard version (initial dose plus doses one and six months later), and followed up for about seven months in the period from May 2003 to March 2006. Blood tests before the last dose, and at the final assessment seven months after the first dose, were used to establish whether immunisation had been successful. These respectively indicated the success rate after two of the intended doses and after all three.

In reality, all the injectors had to return after screening for the results and to get their first doses. The impact of instead administering the first dose to everyone at the screening visit – without waiting for test results to confirm whether they actually needed vaccination – was simulated by the mathematical model which estimated the consequences of the different vaccination strategies. The potential benefit is to ensure that everyone gets at least one dose, feeding through to more people (if the test proves they need these) also getting two and three doses.

This gave the study four combinations of initial dosing (at screening or after results known) and length of dosing schedule (standard or condensed). Of the four, waiting for the screening result and then dosing according to the longer schedule was normal practice. The study aimed to test whether this could be bettered by starting dosing actually at the screening visit and/or by condensing the vaccination schedule.

On the longer standard schedule, 76% of the injectors who took their first dose also took a second, and 52% took all three. On the condensed schedule, the corresponding proportions were 78% and 64%, indicating that this improved completion of the course of vaccinations. Nevertheless, the longer schedule achieved a slightly better rate of successful immunisation (86% versus 78%). After just two doses, across both groups 60% were successfully immunised.



These results were fed in to the mathematical simulation which embraced all 1964 injectors recruited to the study. Compared to not vaccinating at all, the estimates were that vaccination would prevent from 225 to 382 infections among the 1964 injectors (of whom 860 were vulnerable to infection), and per person preserve from on average just under a month to nearly one and a half months of life adjusted for quality ▶ *chart*. Condensing the schedule and dosing at screening both made their own contributions to raising the figures; maximum gains were achieved when they were combined. This combination averted 70% more infections than the usual programme and gained around 70% more quality adjusted years of life.

The order of preference was the same when each programme's costs were balanced against future medical costs associated with hepatitis B infection. Without vaccination, over the injectors' lifetimes the health service would spend $1,414,526 treating complaints associated with hepatitis B infection. After accounting for their own costs, each of the four vaccination programmes would cut this bill by from $157,967 to $473,999; again, maximum savings amounting to about $241 per injector accrued from starting vaccination at screening and condensing the schedule.

Next the researchers tried varying the assumptions built in to the mathematical simulation. Enabling more injectors to complete their vaccination programmes would

make a substantial contribution to increasing benefits and savings. Savings were also dependent on how many of the screened injectors were susceptible to the disease and therefore in a position to benefit from vaccination. When 75% were already infected, none of the vaccination programmes any longer paid for themselves by averting future medical costs. The same would be true if under 1 in 40 became infected each year, or if each year at least 29% permanently stopped injecting, reducing their infection risk even in the absence of vaccination. The simulation initially assumed that all infected injectors would be appropriately treated for their hepatitis B disease. If in contrast it was assumed that at least 54% did not have access to medical care, then again none of the vaccination programmes would any longer pay for themselves.

For the authors, their results indicated that over the long term, hepatitis B vaccination campaigns targeting injectors through needle exchanges save money for the health service, largely because many exchange users are not yet infected or immune, but many would become infected due to risky injecting. This logic can be extended to any programme or service in repeated contact with such populations. The most cost-saving and cost-effective vaccination strategy included giving the first dose to all screened participants before knowing their test results, and then (if needed) administering further doses according to the condensed schedule. The implications of the findings are that US needle exchange programmes and other services repeatedly seeing high risk injectors should screen and offer vaccination for hepatitis B infection.

FINDINGS Substantial as the estimated savings in money and lives were, the authors pointed out that these figures are likely to underestimate the benefits of a hepatitis B vaccination programme for injectors. For example, the calculations were confined to the screened injectors, excluding benefits accruing because successfully immunised patients would not infect other people. On the other hand, patients were paid on average $15 for each immunisation visit. To what degree these incentives raised completion rates is unclear but important, because these rates are critical to the benefits and savings.

For most people including injectors, UK health departments now recommend the condensed schedule used in the featured study, with if possible a booster a year after the first dose for those at continued risk. An even more condensed version over three weeks is licensed for injectors and others at imminent risk of infection. The guidance also recommends starting vaccination immediately and before test results are available. Together this means UK guidance replicates the programme found most cost-effective in the featured study.

Parameters of infection and testing in Britain are similar to those assumed in the featured study, suggesting that on these grounds there is no reason to discount the relevance of its findings to the UK. In Britain in 2007, 15% of injectors tested for hepatitis B at drug services tested positive, including 5% injecting for up to three years. These figures had dipped from 21% and 10% the previous year. At the time these figures were published, introduction of a new test in 2007 could not be ruled out as a cause of the dip. Relying on the previous year's test of known accuracy, the figures are well within the range which, in the US context, the featured study found resulted in health care cost savings from the programmes. So too is the vaccination completion rate; in 2004, 63% of injectors sampled in England who had started the course completed it, nearly the same as in the condensed schedule in the featured study.

As the authors point out, the logic of the study can be extended to any programme or service which comes into repeated (or extended) contact with such populations. As well as needle exchanges, prime amongst these in Britain must be drug services (especially substitute prescribing programmes), general practitioners and prisons. In Britain, injectors tested for infection at drug services increasingly report having been vaccinated against hepatitis B, rising to nearly two thirds in 2006, probably reflecting improved provision through drug services and prisons. Despite this general progress, needle exchanges have been lagging behind. In 2003–2004, injectors in or out of treatment in England were twice as likely to have been vaccinated at a treatment service as at a needle exchange (where just 14% received their doses); prisons had vaccinated nearly three times as many injectors as exchanges. In 2006, a survey of drug service and needle exchange clients in England painted a similar picture; the great majority had been vaccinated, but for just over 10% had this been done at needle exchanges.

Britain's Health Protection Agency has expressed concern that at most only half of English non-pharmacy exchanges provide on-site vaccination. Even fewer (42%) of the non-pharmacy services who responded to this survey in 2005 tested on-site for hepatitis B infection, and very few pharmacy-based schemes asked about virus infection or directed clients to screening and vaccination services. When England's local drug action teams were audited in 2006/2007, testing and vaccination for hepatitis B was among the least well provided harm reduction service. In Scotland in 2005 the situation was even worse, with under 30% of non-pharmacy exchanges providing on-site vaccination and just over 30% testing.

The UK's National Institute for Health and Clinical Excellence (NICE) recommends that all specialist needle exchanges should offer (or help people access) hepatitis B testing and vaccination, and the National Treatment Agency for Substance Misuse now monitors the offer of vaccination by drug services and actively promotes improved provision through the annual treatment planning process.

In summary, for Britain the overall picture is one of substantially but patchily improved access to hepatitis B testing and vaccination, with a wide service gap at needle exchanges in particular, despite their being among the most important venues for this work. Conceivably progress at exchanges has been held back by the emphasis in recent national policies (feeding through to associated targets and funding) on treatment in the service of crime reduction and reintegration rather than harm reduction. What the featured study shows for the USA, and suggests for the UK, is that in respect of hepatitis B testing and vaccination, this may a short-sighted policy which will cost lives and health service resources in years to come.

Thanks for their comments on this entry in draft to Lauretta E Grau of Yale University School of Medicine. Commentators bear no responsibility for the text including the interpretations and any remaining errors.

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