

The United Kingdom's hepatitis B immunisation strategy – where now?

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Summary: *The World Health Organization recommended in 1992 that all countries should introduce universal hepatitis B vaccination into their immunisation schedules by December 1997. Over 80 countries, many of them in western Europe, have complied with the recommendation, but, in the United Kingdom (UK), hepatitis B vaccine is offered to selected high risk population groups only. Vaccination uptake in many of these groups is poor and transmission of hepatitis B remains a problem. The current incidence of hepatitis B is lower in the UK than in countries that have adopted a universal approach. It is impossible, however, to predict the number of acute infections that might occur in an unvaccinated teenage population in the year 2015 if the UK's current strategy remains unaltered. Universal immunisation would guarantee that hundreds, if not thousands, of acute illnesses and an appreciable number of severe outcomes would be prevented each year. The authors believe that funding this intervention would be money well spent.*

Key words:

- health planning
- hepatitis B virus
- immunisation
- preventive health services
- risk factors

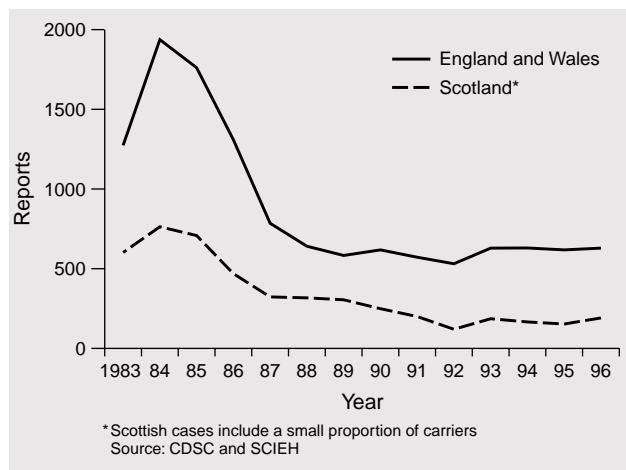
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In 1992, the World Health Organization (WHO) recommended that all countries should introduce universal vaccination against hepatitis B into their immunisation schedules by December 1997, regardless of the national prevalence of the infection^{1,2}. This strategy has been implemented in most European countries, the United States (US), and Canada³, but not in the United Kingdom (UK) or Scandinavian countries. This paper discusses current guidelines

from the UK Departments of Health for vaccination against hepatitis B, including the potential difficulties of targeting "at risk" groups, the rationale for a universal immunisation policy, the options available for the future, and the practicalities of implementation.

Figure 1 shows the numbers of acute hepatitis B cases reported by laboratories in the UK to the PHLS Communicable Disease Surveillance Centre (CDSC) and to the Scottish Centre for Infection and Environmental Health (SCIEH) between 1983 and 1996. Numbers do not account for underreporting and some hepatitis B carriers could not be eliminated from the Scottish totals. Seventeen thousand cases were reported during the 14 year period. Only for cases in England and Wales are data on risk categories satisfactorily collected and, even here, such data were unavailable for between a third and a half of cases each year. In 1995, 562 acute cases were reported to CDSC, 323 of which could be linked to risk data - 45% were injecting drug users, nearly 30% were heterosexuals, and 22% were homosexual males. Twenty-seven cases had risks associated with households, institutions, or medical treatment, and there were no occupational cases.

FIGURE 1 Acute hepatitis B reports to CDSC (England and Wales) and SCIEH (Scotland)



Current strategy

The UK has employed a selective strategy for the delivery of hepatitis B vaccine since it first became

available. Figure 2 lists the risk groups for which vaccination is currently recommended⁴. To show how successful vaccination coverage has been in the context of the risk that people in each target population have of acquiring hepatitis B, the authors have classified the risk groups into two categories - those with moderate to good coverage and those with poor coverage. The classification process is based on several factors - the authors' (albeit incomplete) knowledge of current practices, particularly in Scotland; numbers of reported acute infections attributed to the different risk groups; and the sparse published data (see below) that are available on uptake rates. One of the major problems of the targeted programme is that vaccine coverage is not recorded systematically.

People with chronic renal failure or haemophilia, people in institutions for learning difficulty, people whose occupations (further divided into health care workers and others) put them at risk, and people who travel to high prevalence areas have been placed in the moderate/good grouping. Babies born to infected mothers, injecting drug users, family contacts, families of adopted children, prisoners, and people with multiple sex partners have been allocated to the poor coverage category. Relatively few acute infections have been reported in the groups whose vaccination coverage has been moderate/good, but there is still room for improvement. For example, appreciable numbers of people with chronic renal failure are not immunised⁵, and although most health care workers are immunised, some of those who perform invasive procedures still escape the vaccination schedule. The importance of preventing the transmission of hepatitis B between health care workers and patients cannot be overemphasised, yet a recent study showed that about 50% of invasive cardiologists in the UK had been either incompletely or never immunised⁶. Travellers to high prevalence areas are at risk of contracting hepatitis B and, in England and Wales, 13% of infections each year since 1989 are thought to have been acquired abroad. The proportion of those who are vaccinated before travelling to regions where hepatitis B is highly endemic is unclear, but travel to such areas is increasingly popular.

Figure 2 also shows how the selective strategy has evolved^{4,7-10}. Since the number and type of risk groups selected for vaccination has changed little since 1988, lack of time to develop effective methods of accessing individuals at risk cannot be used to excuse poor vaccine uptake. This applies particularly to the risk groups in the poor coverage category. People who have multiple sex partners are a heterogeneous group. A gay man who attends a genitourinary medicine (GUM) clinic is more likely to be offered the vaccine¹¹ than a heterosexual attending such a clinic¹¹, and a person who has had multiple partners and does not attend a GUM clinic is highly unlikely to be offered vaccine.

Injecting drug users probably fare worse. Between 20% and 40% of injectors from different regions in

FIGURE 2 Implementation of hepatitis B immunisation targeted strategy (1982-1996)

	Year of recommendation			
	1982	1988	1990	1996
Moderate to good coverage				
Haemophiliacs			+	
Patients with chronic renal failure	+/-	+		
Staff and patients, in learning difficulty establishments*	+			+
Travellers to high prevalence areas		+		
Health care workers	+/-	+		
Other occupational groups		+		
Poor coverage				
Babies born to infected mothers		+		
IDUs		+		
Family contacts of a case/carrier	+/-	+		
Families of adopted children				+
Prisoners		+		
Persons with multiple sex partners		+		

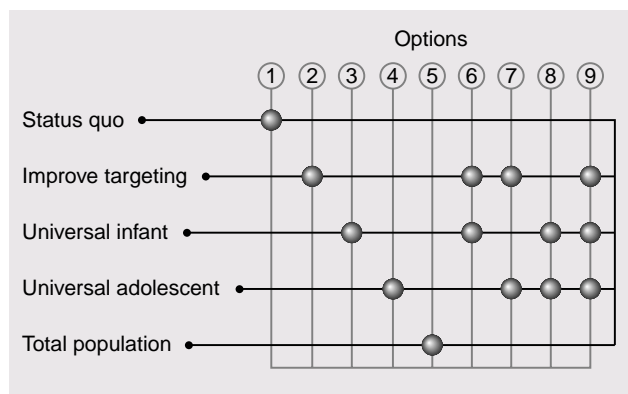
* Applies to residential institutions in 1982 and day care/schools in 1996

England and Wales had core antibody to hepatitis B virus in 1995¹². Since the estimated 100 000 current injectors in the UK are clearly at high risk of infection it is extremely disappointing that only about 10% of NHS and non-NHS services for drug users in 1993 offered the vaccine¹³. The level of success varies widely. In Liverpool, for example, a large proportion of injectors have been fully immunised (N Beeching, personal communication). In Glasgow, which has the highest prevalence of drug injecting in the UK, thousands of injectors attend needle/exchanges and primary care centres for methadone but are not offered vaccination. It is therefore unsurprising that a study of 1200 Glasgow injectors in the early 1990s showed that 62% carried hepatitis B virus core antibody (unpublished data). Experience in working with and researching injecting drug users has led the authors to conclude that two of the main reasons why vaccine is not usually offered are a lack of interest among health care workers and insufficient resources.

Similarly, poor vaccination coverage applies to prisoners. A 1996 study of 400 inmates in two Scottish prisons showed that only 4% had ever been offered vaccination¹⁴; lack of access to the target population could not have been used as an excuse. An outbreak of acute symptomatic hepatitis B infection that affected eight male prisoners of HMP Glenochil (central Scotland) in 1993 alerted the authorities to random needle sharing among large numbers of injector inmates¹⁵. This incident precipitated a public health investigation, which led to the detection of 13 HIV transmissions. Ironically, had it not been for the non-existent vaccination programme, the HIV outbreak would probably have gone undetected and been far larger.

Immunisation of babies born to infected mothers probably provides the greatest benefit per single completed schedule. Universal antenatal screening for hepatitis B infection is currently recommended by UK

FIGURE 3 Future UK strategy options



Departments of Health because selective screening of high risk pregnant women is considered unsatisfactory^{16,17}. Analysis of 22 studies¹⁹, conducted mainly in the US, showed that a median of 50% (range 0% to 100%) of pregnant women positive for hepatitis B surface antigen would have been detected by selective screening of those at 'high risk only'¹⁸. A survey to determine the extent of universal screening in the UK is being carried out by the Institute of Child Health in association with CDSC and SCIEH. In Scotland, during 1996, half of the health boards performed universal screening while the other half used selective screening. Some rural boards with relatively few people at risk conducted universal screening while Lothian health board, for example – with large numbers of injectors and gay men - had a selective policy. Boards that carried out selective testing only did so either because they lacked resources or because they considered universal screening to be unnecessary.

In many instances, therefore, the present immunisation strategy functions poorly, and there are clear inequalities. In addition to the obvious geographical ones, many people at extremely low risk are being vaccinated, while those at highest risk are often unlikely to be offered the vaccine^{19,20}.

Future options

There would appear to be nine options for the future (figure 3), but two of these are unrealistic. The reasons above suggest that it is unacceptable to leave things as they are, and immunising the whole population would involve the unnecessary vaccination of huge numbers of elderly people whose risk of infection would be negligible.

The three main approaches are to improve targeting, to provide universal infant immunisation, and to provide universal adolescent immunisation.

FIGURE 4 Evaluating principal approaches

	Ability to achieve uptake	Immediacy of impact
Improve targeting	+/-	+++
Universal infant	+++	+
Universal adolescent	++	++

Each has its benefits and drawbacks. Figure 4 grades the relative performance of these approaches in terms of the immediacy of their impact and the ease with which a high vaccination coverage might be achieved. The authors believe that vaccination uptake could be improved dramatically among many of the high risk groups but that, in addition to considerable resources, this would require commitment of the highest level in departments of public health, prisons, drug use agencies, GUM clinics, obstetric units, and among general practitioners. Even then, an appreciable number of people at risk would still either not be offered or not accept vaccination. This is unfortunate because, of all the approaches, targeting provides the greatest immediacy of impact. Of all the groups to be targeted for vaccination, infants born to infected mothers should be given the greatest priority. Universal screening for hepatitis B should be implemented in all antenatal settings and exposed infants should receive a full course of vaccination.

Universal infant vaccination would have little impact for many years because it would not prevent vertical transmission and data from the PHLS show that a child is very unlikely to acquire hepatitis B infection in the UK²¹. This drawback is offset by the high coverage likely if the vaccine could be included in the primary immunisation schedule. Preliminary data collected by the Health Education Authority suggest that parents would accept the addition of hepatitis B vaccine at this time²².

Universal adolescent vaccination would have more immediate impact than universal infant immunisation but it is unlikely that levels of coverage exceeding 90% would be achieved unless a single dose vaccine was available. Even then, acceptability might be a problem, since many parents of adolescents might regard the issues surrounding hepatitis B prevention as irrelevant to their children. Universal immunisation, particularly infant immunisation, would convey some less obvious benefits. For example, it is not uncommon for a public health physician to manage the problem of an adopted child who attends a nursery and is found to carry hepatitis B e antigen. The anxiety among parents of the other children, precipitated by the discovery of this potential source of infection, would not be generated if all infants were vaccinated.

Adopting both universal regimens and improving the current targeted approach would have the greatest impact in preventing infection over the short, medium, and long terms. Adolescent immunisation could cease after 10 to 12 years and, for most of the groups at risk, targeting could be phased out gradually. Universal antenatal screening would need to continue, however, at least until real signs of global hepatitis B elimination appeared²³.

Hepatitis B vaccination is safe and very effective^{24,25}, but some potential problems do exist. The duration of protection is unknown, but there is increasing evidence that immunological memory may last longer than originally thought²⁶. Also, certain

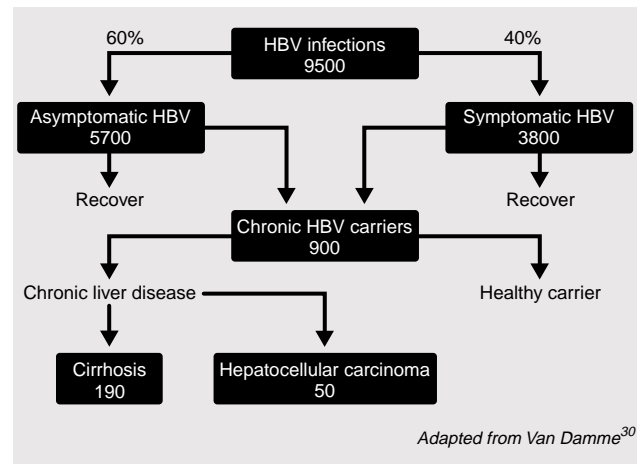
mutant hepatitis B infections (surface antigen escape mutants) are rare but have been described in all five continents; the current vaccine would not protect against these mutants.

The cost effectiveness of universal vaccination in the UK has been investigated recently^{28,29}. The estimated costs (not discounted) per year of life gained ranged between £2000 and £13 000 and depended on assumptions relating to factors such as the incidence and prevalence of hepatitis B infection and the age of the population to be vaccinated. If an intervention does not yield an immediate benefit but one which will materialise in future years, the process of discounting involves calculating the cost of the intervention on the basis that the initial outlay could have been used for alternative purposes with more immediate benefit or left to accumulate interest. Since the impact of vaccination may not be seen for many years, discounted estimates are understandably less impressive and range from £50 000 to £300 000 per year of life gained.

Should the UK's future hepatitis B vaccination strategy depend solely on the outcome of a cost effectiveness evaluation? Supporters of this view would point to the need to adopt an evidence based approach to medicine and to ensure that services are prioritised on the basis of their outcomes. Those who argue that a cost effectiveness analysis should be used merely to aid decision making might consider the two following points. If the UK does not comply with WHO recommendations and does not follow the example set by other European Union countries it could be criticised for not contributing enough to the long term goal of global hepatitis B elimination. Uncertainty exists about the future transmission dynamics of hepatitis B in the UK.

Figure 5 shows a model of the natural history of hepatitis B for the acute infections estimated to have occurred in 1985, based on one that predicted outcomes of infection in the European region of WHO³⁰. The estimate of 9500 acute infections is the number of reported cases multiplied by a factor of four - a factor which accounts for asymptomatic infection, underdiagnosis of symptomatic infection, and laboratory underreporting. Five people would have developed fulminant hepatitis, 190 cirrhosis, and 50 hepatocellular carcinoma, respectively. The model for infections occurring in 1996 suggests that the number of acute infections and severe outcomes would have been a third of those seen in 1985. If, currently, only about 3000 hepatitis B transmissions occur annually in the UK, the incidence of infection (5/100 000) is at its lowest since the early 1980s at least, and is lower than in most other European countries. The impact of universal immunisation depends on the number of infections that would occur in its absence. It is clear therefore that a universal strategy would have less impact in the UK than in most other parts of the world, if it is assumed that that incidence of hepatitis B will not change in the future. The relatively low current incidence of hepatitis B in the UK supports

FIGURE 5 Outcome of HBV infection (1985) in the UK



the case against adopting a universal immunisation strategy here. It is impossible, however, to predict the number of acute infections that might occur in an unvaccinated teenage population in the year 2015 if our current strategy does not change. If the drug injecting epidemic of the early to mid 1980s could have been predicted, and if hepatitis B vaccine had been available in the 1960s, infant immunisation then would have been an extremely attractive proposition. It could be argued that injecting drug users are now less likely to acquire hepatitis B infection because of interventions such as needle/syringe exchange and methadone maintenance programmes, which were introduced in the UK during the late 1980s to combat HIV infection. Uncertainties will always exist, however, about the public health, social, and behavioural climates of the future. Furthermore, in the years ahead, it is likely that the UK public will find it increasingly unacceptable that immunisation against a preventable infection being eradicated elsewhere is not being offered in their country.

So, what strategy will the UK Departments of Health choose? Will they accept that the prevalence of hepatitis B in the UK is too low for universal immunisation and direct efforts towards improving the targeted approach? Or will they give the green light to universal immunisation? Since universal immunisation would guarantee that hundreds if not thousands of acute illnesses and an appreciable number of severe outcomes would be prevented each year, the authors believe that funding this intervention would be money well spent.

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