

Vaccination: A Case Study in Risk Policy

A meeting on 'Risk, Democratic Citizenship and Public Policy' was organised jointly by the British Academy and the Academy of Medical Sciences. A number of high profile issues have forced consideration of risk onto the public agenda, notably those concerned with threats to the environment and human health. As a matter of practical experience and as a result of academic analysis, it seems clear that the regulation of risk and the machinery for enabling public values and priorities to be taken into account when setting public policy needs to be improved. The conference brought together researchers to examine the issues that arise in the making of public policy decisions on questions of risk and safety, and to present the contribution that the social sciences and humanities can make to the understanding of those issues.

*Many areas of public policy can be described as involving risk. In the following extract from his paper, **Professor Peter Lachmann FRS**, President of the Academy of Medical Sciences, discusses the perception of risk and the variation in the degrees of public tolerance towards medical intervention as compared with other risky activities.*

There has recently been a public furore about reports that autism and an unusual form of colitis may be associated with the MMR vaccine (the combined vaccine against measles mumps and rubella). This is based on a report by Wakefield *et al* (1988) which gave an anecdotal description of twelve children where the onset of symptoms was said to be associated with the vaccine. Subsequent epidemiological studies have failed to show any association. Of these three diseases, measles is by far the most dangerous. Measles interferes with immunity mechanisms and, particularly in under-nourished populations, kills many children usually from a subsequent bacterial infection. It can also give rise to encephalomyelitis and to deafness. Furthermore, in around 1 in 20,000 children with measles, infection is followed after some years by an extremely distressing, lethal brain disease known as subacute sclerosing panencephalitis (SSPE). It has been shown that the incidence of SSPE is reduced at least twentyfold by vaccination against measles. For measles also, therefore, the risk to benefit ratio of vaccination must be very low. Mumps is a much less severe disease but can be very unpleasant, particularly if acquired after early childhood and it is therefore well worth immunising against. Rubella in childhood is a harmless disease and the main reason for immunising the population against rubella is to prevent the infection of pregnant women which leads to severe abnormalities in the unborn child. Widespread rubella vaccination has been very successful in reducing this fetal rubella syndrome. Since none of these diseases are close to being eradicated, the reduction in uptake of the vaccines that has followed the publication of the Wakefield work is likely to lead to outbreaks of measles with an increase of serious complications and deaths.

It is interesting that the problems with MMR vaccination are confined largely to the United

Kingdom. On the other hand, in France there has been a scare about the association of hepatitis B vaccination with multiple sclerosis. Hepatitis B is a serious liver disease, which if caught early in life predisposes to liver cancer and where later infection can give rise to cirrhosis. The development of a vaccine against hepatitis B using recombinant surface antigen has been a great success story and the vaccine is widely used. The association with multiple sclerosis is again entirely anecdotal and epidemiological studies show no association. Nevertheless the French government has altered its hepatitis B vaccination recommendations on the basis of this scare.

Why is it that the public reacts so strongly to these vaccine scares although the real benefit is so large? One reason is clearly that the vaccine-damaged child is a real child whose picture can appear in the media and with whom people can identify. On the other hand, the 'vaccine-saved' children, who do not get sick as a result of being vaccinated, are only statistics and their impact is much less.

A second more plausible argument is used by some more sophisticated parents. If all other children are immunised, then the disease will become so uncommon that their children will not need immunisation. Although there is a grain of truth in this argument it fails as soon as it is used by more than a tiny minority.

Thirdly, there are pressures from anti-vaccination groups who object to vaccination as a matter of principle. What underlies this principle is unclear. To some extent these anti-vaccination groups may regard all preventive medicine as 'playing God' and believe that one should be fatalistic about infectious disease. For others it may simply be a strong mistrust of the pharmaceutical industry and of medicine in general. The anti-vaccination movement certainly comes from the same sort

of background as the groups opposed to rational medicine and to the genetic modification of food and to the fluoridation of water.

Another argument often used against vaccination is the 'precautionary principle'. This principle, though very widely quoted, has no agreed definition. It is often used in the sense that nothing should be done until it can be shown, with a very high degree of certainty that no possible harm can result from it. It is therefore often used as a reason for preferring inaction to action whenever there is any uncertainty. However in some situations, for example climate change, the precautionary principle is used as an argument for taking positive prevention actions even when there is still uncertainty as to whether it may be necessary. However, action and inaction in public health are morally equivalent. It is no better to cause harm by doing nothing than by doing something. The precautionary principle in this area can be described as a 'cop out'. A.H. Clough's famous couplet

'thou shalt not kill, but needs not strive
officially to keep alive'

is usually quoted in exactly the opposite sense to which Clough himself meant it, as can be seen from the succeeding couplets in 'The Last Decalogue',

'thou shalt not steal, an empty feat
when it's so lucrative to cheat
thou shall not covet, but tradition
approves all forms of competition.'

Others have discussed why risk tolerance varies so much between different risky activities. It seems clear that risk tolerance is much higher for voluntary than for imposed risk. People accept much higher risks in car travel than they do in rail travel and, curiously, they are relatively unconcerned about the dangers of radon in their houses whereas some have been enormously concerned about the risks (which are negligible) of inhaling zinc cadmium sulphide particles (to which a population of southern England may have been exposed, in the 1950s and 60s, as the results of experiments on surrogate biological warfare by the Ministry of Defence). It is also clear that risk tolerance is much higher when there is individual benefit. For example, mobile phones are tolerated much more readily than genetically modified food.

There is also clearly a hierarchy of activities, which vary in their acceptability of risk. Taking part in sport, be it sailing, horse-riding, mountain climbing or football, entails much higher risks than would be tolerated in driving cars or riding bicycles. There is, in its turn, much higher risk tolerated in therapeutic procedures such as surgical operations than is tolerated in drugs or food; and vaccination appears to attract the highest risk intolerance of all. Finally, there is the fear of unknown secondary effects, for example starting an epidemic.

The risk reduction costs of these different activities must also be very different. The amount it costs to save one extra life on roads and railways is roughly known and has been discussed by others. On the railways it is said to be of the order of two million pounds

per life saved and on roads probably rather less than this. The costs in late drug development for saving one extra life is probably higher than this and for vaccines the cost is not known but is presumably higher again. For example, making an already safe vaccine even safer will involve re-licensing the new product. The trials needed for this purpose will be enormously expensive.

There is an interesting argument to be made whether there is indeed an absolute right to refuse vaccination when to do so might endanger the lives of others. There are very polarised differences of view at this point between libertarians who place a very high emphasis on consent and feel that without proper informed consent no activity should be carried out, and the utilitarians who place much higher importance on the greatest good to the greatest number. There are, of course, many intermediate views and one would hope that some middle ground between strongly libertarian and strongly utilitarian views on this subject can be found. In the United Kingdom, compulsory vaccination was abolished in 1948 when the National Health Service Act was brought in and vaccination, although strongly advocated, is entirely voluntary. In the United States and in France, vaccination is also not compulsory but the public school system requires it and, since education is compulsory, the choice of not having a child vaccinated carries with it the requirement that one has the child educated privately. The exercise of this particular freedom is, therefore, expensive.

It is also worth bearing in mind that the World Health Organisation has conducted a successful campaign to eradicate smallpox by vaccinating virtually the whole world population. This was done over a relatively short period of time and it is quite clear that this was done without informed consent being obtained from every vaccinated child or its parents. This sort of eradication campaign is done using 'group' or 'community' consent where it is the community concerned that consents to the eradication campaign and there is then little or no choice given to those that take part. Since eradication of disease does require an extremely high uptake of vaccination, there are good reasons for this, and it is interesting that this process has been widely accepted as justified. There is a similar campaign to eradicate polio by worldwide vaccination that is likely to come to fruition quite soon and an attempt is likely to be made thereafter to eradicate measles. Such eradication can work only when the organism has humans as its sole host and can not work for diseases such as tetanus or yellow fever where infection of humans is, from the point of view of the pathogen, irrelevant to its persistence.

Vaccination provides a powerful example where the public perception appears to be very distorted from the established realities. It is, therefore, a good example for studying how such disconnections come about. Furthermore, failure of vaccination against important diseases is dangerous both to the individual and to the public health. Those of us in medicine would greatly value advice from social scientists on how this problem could best be addressed.

The volume of edited papers from the conference will be published as a British Academy Occasional Paper.