Childhood immunisation: a guide for healthcare professionals

British Medical Association
Board of Science and Education

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Childhood immunisation: a guide for healthcare professionals

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Foreword

The Board of Science and Education, a standing committee of the British Medical Association (BMA), provides an interface between the medical profession, the government and the public. One major aim of the board is to contribute to the improvement of public health, and it has developed a wide range of policies on the health of specific groups such as children and the elderly. Furthermore, the board’s work on infectious diseases has resulted in a number of publications including the *BMA guide to rabies* (1995), *Bloodborne viruses and infection control: a guide for healthcare professionals* (1998) and *Sexually transmitted infections* (2002).

At the BMA's 2002 annual representative meeting a motion on immunisation against childhood infectious diseases was debated and referred to the board of science and education for further consideration. In addressing this resolution, the board decided to write a report for general practitioners which reviews the principles of vaccination and immunisation in the UK in children aged 0 to five years. Vaccines not included in the UK immunisation programme, but given to children if clinically indicated, are also mentioned.

There have been concerns over vaccination since the introduction of variolation in the 18th century. In the middle of the 19th century and more recently, the need for compulsory immunisation has been widely debated in the public domain. The recent debate has been fuelled by publications suggesting a link between the measles, mumps and rubella (MMR) vaccine and autism or inflammatory bowel disease, although the validity of this research is disputed. The debate surrounding the MMR vaccination is considered in this report along with issues that concern other types of childhood vaccinations such as tetanus and diphtheria. Increased societal concern regarding the safety of vaccines has an impact on the risk tolerance of parents and healthcare professionals. This report is intended to assist general practitioners and other healthcare professionals in discussing the health benefits and potential risks of vaccination with parents so that informed decisions can be made.

Professor Sir David Carter
Chairman, board of science and education
June 2003

Please note that this report is a guide for general practitioners and other healthcare professionals on issues relating to childhood immunisation – it is not intended to be a comprehensive text on immunisation. Where appropriate, the reader is referred to specialist texts for more detailed information.
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Introduction

Vaccines are among the safest and most successful public health measures available for preventing infectious diseases and their complications. Effective immunisation has made a major contribution to reducing the incidence of infectious diseases and in eradicating naturally occurring smallpox. It is hoped that poliomyelitis (polio) will also be eradicated soon. Immunisation programmes have probably saved more lives than any other public health intervention, apart from the provision of clean water. In the UK, childhood vaccinations against infectious diseases are taken up on a voluntary basis.

Infections are extremely common in childhood. In the UK, most are short-lived and cause no long term problems (although they are a major cause of hospital admissions in children). However, some result in more serious sequelae; for example, tetanus has a 30 per cent mortality rate. Many infectious diseases can now be prevented by vaccination at various stages during childhood. Despite this, infectious diseases remain a major cause of mortality worldwide, accounting for approximately 17 million deaths annually in developing countries and 500,000 in the industrialised world. In developing countries they account for more than 70 per cent of the overall burden of disease and in industrial countries they are a major cause of absence from school and work. In developing countries, factors such as inadequate nutrition and poor sanitation can increase disease prevalence and reduce the body’s ability to resist and defend against infection, resulting in an increase in death rate.

With the use of vaccinations, smallpox was eradicated in 1980 with no reported deaths since then. However, new threats have emerged and other diseases have become more prevalent or increasingly recognised as problems in the UK. Examples include human immunodeficiency virus (HIV), variant Creutzfeldt-Jakob disease (vCJD), malaria, meningococcal meningitis, hepatitis C, West Nile fever, tuberculosis and Escherichia coli O157. These infectious diseases, together with the possible resurgence of measles and the growing threat posed by antibiotic resistant organisms (for example, Methicillin Resistant Staphylococcus Aureus (MRSA)), represent a significant challenge to healthcare providers for years to come. There is also the possibility that with the occurrence of global warming, diseases such as West Nile fever and malaria, which are normally confined to the tropics, may occur in previously more temperate regions.

The great increase in international travel has the potential to spread disease rapidly between countries and continents. Children may be more likely to come into contact with people from countries that do not have effective immunisation programmes and therefore a higher incidence of infection. Such people may not have been vaccinated and are therefore more likely to be carrying disease. In addition, UK children travelling abroad can be placed at greater risk of infection if they have not been fully immunised at home and may carry infection on their return to the UK. The increasing speed of travel is likely to shorten the gap between an infection appearing in one country and subsequently in another. This has implications for the development and implementation of measures to prevent or contain a potential influenza pandemic for example. The time taken to produce and distribute a vaccine specific to the appropriate strain of the influenza virus could mean that the vaccine may not be available by the time a new strain reaches the UK. In February 2003, severe acute respiratory syndrome (SARS) was first recognised as a new disease in mid-Asia. Within one month there were reports of more than 450 cases and 17 deaths across 13 countries on three continents. Cases that were identified in countries outside the initially infected areas had arrived by air transport.

Bacteria and viruses have a variable capacity to evolve and mutate naturally, and new strains may also be genetically engineered. Bioterrorism could result in the resurgence of diseases such as smallpox, as well as the development of new strains of microorganisms. New vaccines are continually being developed, for example against malaria; and ‘new’ infections such as HIV may in time be preventable by vaccination. It is imperative that research is funded appropriately to allow the development of these new vaccines.

Healthcare professionals must ensure that as many children as possible continue to receive protection against the infectious diseases for which safe and effective vaccines are available. To protect children from these serious diseases, the level of immunity within a community must remain high, otherwise epidemics can ensue. As stated by Conway and Leese, ‘the enemies of our children’s health are contained but not defeated’.
Why vaccinate?

Many childhood diseases which cause significant morbidity and mortality can now be prevented by vaccines that have high efficacy and are considered safe, in that their side effects have an acceptably low incidence and severity. In combination with improvements in hygiene and nutrition, public vaccination programmes have saved millions of children from suffering and death. For example, prior to the introduction of the diphtheria vaccine in 1939, around 45,000 notifications were recorded annually in the UK, with over 2,000 deaths. In 1957, only 37 notifications were recorded with six deaths (figure 1, appendix I). Haemophilus influenzae type b (Hib) infection has the potential to cause severe problems in that significant complications such as epiglottitis and meningitis occur in 40 per cent of cases. Since the vaccine was introduced in 1992, infections due to this bacterium have become rare, although recent indications are that the incidence of Hib in the UK is starting to rise once more. Possible reasons are: random variation in Hib disease occurrence; decreasing population immunity; or the fact that the UK schedule provides Hib vaccination at two to four months of age with no booster. Therefore, there are plans to enhance immunity by offering all children aged between six months and four years an extra dose of the vaccine.

Ultimately, it is intended that vaccination programmes will completely eradicate some diseases such as polio and measles, and greatly reduce the prevalence of others. In an ideal world no one would need to be vaccinated. This was thought to be the case for smallpox, a disease eradicated in 1980 but now seen as a potential bioterrorism threat. However, some diseases such as diphtheria, cannot be eradicated because the organism can be carried by people who are asymptomatic. If everyone was vaccinated, immunity was lifelong and there were no vaccine failures, then carriage by asymptomatic protected carriers would not present a problem. However, this scenario is highly unlikely and in reality there will always be people who are susceptible to transmission from protected asymptomatic carriers. Furthermore, once universal vaccination ceased, invasive disease due to the organism would become re-established as the number of susceptible individuals grew. In addition, other organisms have non-human reservoirs, for example tetanus spores in soil, that would frustrate attempts to eradicate disease.

Figure 1: Number of notifications and deaths from diphtheria in the UK during the 20th century

<table>
<thead>
<tr>
<th>Year</th>
<th>Notifications (thousands)</th>
<th>Deaths (thousands)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1924</td>
<td>7</td>
<td>5</td>
</tr>
<tr>
<td>1934</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>1944</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>1954</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>1964</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>1974</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>1984</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>1994</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Source: Office for National Statistics

a There are a number of reasons why some diseases cannot be eradicated, this is calculated using computer modelling.
In 2001 in the UK, nearly 95 per cent of two year olds were fully immunised against diphtheria, tetanus, pertussis, Hib and polio; and over 85 per cent had had the measles, mumps and rubella (MMR) and MenC vaccines. It is essential that this level of coverage is maintained and in the case of MMR and MenC increased. If immunisation levels drop, the risk of epidemics rises.

Programme of immunisation in the UK for 0-5 year olds (2003)

*Table 1: The recommended national schedule in the UK*

<table>
<thead>
<tr>
<th>When to immunise</th>
<th>The vaccine</th>
<th>Type of administration</th>
</tr>
</thead>
<tbody>
<tr>
<td>2, 3 and 4 months old</td>
<td>Polio</td>
<td>By mouth</td>
</tr>
<tr>
<td></td>
<td>Diphtheria, Tetanus, Pertussis</td>
<td>One injection</td>
</tr>
<tr>
<td></td>
<td>and Hib (DTP-Hib)</td>
<td>One injection</td>
</tr>
<tr>
<td></td>
<td>MenC</td>
<td></td>
</tr>
<tr>
<td>12-15 months</td>
<td>Measles, Mumps and Rubella (MMR)</td>
<td>One injection</td>
</tr>
<tr>
<td>3 to 5 years (pre-school)</td>
<td>Polio</td>
<td>By mouth</td>
</tr>
<tr>
<td></td>
<td>Diphtheria, Tetanus and acellular Pertussis (DTaP)</td>
<td>One injection</td>
</tr>
<tr>
<td></td>
<td>Measles, Mumps and Rubella (MMR)</td>
<td>One injection</td>
</tr>
</tbody>
</table>

Bacillus Calmette-Guerin (BCG) vaccine is usually offered to children of 10 to 14 years of age. However, the vaccine is offered to younger children who are deemed to be at high risk, for example, those who are likely to travel to areas where there is a high prevalence of tuberculosis (TB), or come into contact with people who have visited these areas. Furthermore, in some areas of the UK neonatal BCG is offered to all babies, and in other areas a selective policy is implemented.

As a result of an increase in cases of Hib, health departments are planning a catch-up campaign where all children under four years of age will be offered an extra dose of the Hib vaccine. The Department of Health is currently considering whether the schedule needs to be changed in the future for Hib and other vaccines.

Varicella (chicken pox) vaccination is not a part of the standard childhood immunisation programme in the UK. Its introduction at the same time as MMR vaccination has been considered, although in March 2003, the Department of Health confirmed that it was not planning to introduce a combined MMR and varicella vaccine. Varicella is very common in childhood and is highly contagious. The infection is usually mild and results in lifelong immunity to varicella caused by future contact with the disease, but not to reactivation of infection causing herpes zoster. Therefore, around 90 per cent of adults are protected against further exposure to the virus. The length of immunity following vaccination is not known.
Vaccination against varicella is available on a ‘named-patient’ basis and is recommended for individuals who fulfil all of the following three criteria:

- have a clinical condition which increases the risk of severe varicella. For example, immunosuppressed patients, neonates, pregnant women
- have no antibodies to varicella-zoster virus
- have significant exposure to chickenpox or herpes zoster.

In the UK, the hepatitis B vaccine is given to children who are deemed to be at high risk (ie those born to hepatitis B carrier mothers), whereas in countries such as Taiwan and South Korea, where hepatitis B is highly endemic, it is administered routinely. In January 2003, the Public Health Laboratory Service (PHLS) confirmed that it was studying the costs and benefits of universal childhood vaccination against hepatitis B in the UK. If there is a case, the matter will be considered by the Joint Committee on Vaccination and Immunisation (JCVI), an independent expert group which advises UK health departments.

A number of other vaccines are candidates for introduction into the childhood schedule, in particular the pneumococcal conjugate vaccine.

**Immunisation coverage in the UK**

UK figures for immunisation coverage for children aged one, two and five years are compiled quarterly. The percentages of children immunised by their second birthday are given in appendix II (which also gives sources showing coverage for one and five year olds). According to the National Schedule, children should have been immunised against the following diseases by the time they are two years old: diphtheria, tetanus, polio, pertussis (whooping cough), Hib, MMR and meningococcal serogroup C infection (MenC). MenC vaccine was introduced in November 1999 and statistics are available from 2000-01 onwards.

**England**

Since 1995, there has been over 90 per cent uptake for all immunisations except MMR. Although MenC was only recently introduced, most data now point to uptake levels similar to DTP. Since 1996, the uptake of all immunisations has fallen by around 1 per cent, but for MMR the figure is 3 to 4 per cent (coverage was down to 87 per cent in 2000-01).

**Scotland**

In Scotland, coverage has been relatively stable since 1998, although MMR coverage has decreased from 93.2 per cent in 2000 to 88.5 per cent in 2001. Coverage for MenC in 2001, was high at 93.7 per cent.

**Northern Ireland**

Immunisation coverage in Northern Ireland is fairly stable at more than 95 per cent for all diseases, but MMR uptake fell from 92.5 per cent in 1997 to just below 90 per cent in 2001. Coverage for MenC in 2001 was nearly 90 per cent.

**Wales**

Since 1997 immunisation coverage has fallen, particularly in the case of MMR where it decreased from 92 per cent in 1995-96 to 84 per cent in 2001-02. Wales is the only country with two years of data for MenC; coverage has risen from 80 per cent in 2000-01 to 92 per cent in 2001-02.

**General**

In the UK there is most concern with regard to MMR coverage. In all UK countries, the latest figures (2000-01) show that the percentage of two year old children immunised against MMR has fallen below 90 per cent. As the coverage required for population immunity (see below) for measles is 92 to 95 per cent there is concern about the likelihood of a measles epidemic. The reduced coverage for all immunisations in England and Wales may reflect heightened public anxiety about MMR.

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b Confirmed by DoH, March 2003
c For a definition of significant exposure please refer to ‘The Green Book’.
d Now part of the Health Protection Agency (HPA)
The dangers posed by falling immunisation coverage are real. For example, in 1974, Japan (where vaccination is not compulsory) had a reasonably successful pertussis vaccination programme in which nearly 80 per cent of children were vaccinated. There were only 393 cases of whooping cough that year, and no deaths. In 1975, pertussis immunisation in Japan was suspended for two months following the deaths of two children who died within 24 hours of receiving the vaccine, although it was later found that their deaths were not caused by vaccination. Rumours that the vaccine was unsafe meant that by 1976, coverage for two year olds had dropped as low as 10 per cent. In 1979 Japan suffered a major pertussis epidemic with more than 13,000 cases and 41 deaths. In 1981 the government began vaccinating with acellular pertussis vaccine, and the number of pertussis cases dropped again.16

A similar situation occurred in the UK following publication of a paper in 1974 that suggested a link between the pertussis vaccine and encephalopathy causing serious conditions of the nervous system, such as epilepsy and learning disorders. This led to a fall in the number of children immunised and hence an increase in cases. There were about 100,000 extra cases of whooping cough between 1977 and 1980.17

**Population immunity**

Population immunity is the state achieved when immunisation programmes reach sufficiently high coverage of the target population to interrupt transmission within the community (table 2). Both immunised and non-immunised individuals then benefit. Population immunity is one of the factors taken into account in all national immunisation programmes. The percentage of the population that must be immunised for population immunity to be created depends on:

- the infectivity of the disease
- the susceptibility of the population (this depends on whether the disease has been circulating in the community and for how long)
- the vulnerability of the population (for example, those living in the overcrowded inner city would be more vulnerable than those living in a sparsely populated rural area)
- environmental factors (for example, reservoirs of the organism)
- the efficacy of the vaccine.

<table>
<thead>
<tr>
<th>Disease/vaccine</th>
<th>% coverage required for population immunity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diphtheria</td>
<td>80 – 85</td>
</tr>
<tr>
<td>Tetanus</td>
<td>Not applicable as no person to person spread</td>
</tr>
<tr>
<td>Polio</td>
<td>80 – 85</td>
</tr>
<tr>
<td>Pertussis</td>
<td>92 – 95</td>
</tr>
<tr>
<td>Measles</td>
<td>92 – 95</td>
</tr>
<tr>
<td>Mumps</td>
<td>90 – 92</td>
</tr>
<tr>
<td>Rubella</td>
<td>85 – 87</td>
</tr>
<tr>
<td>Hib</td>
<td>No figures*</td>
</tr>
<tr>
<td>MenC</td>
<td>No figures*</td>
</tr>
</tbody>
</table>

* There is no published evidence on the level of coverage required for population immunity to Hib and MenC. This is because the organisms are carried in the nasopharynx of healthy individuals and the vaccines are designed to protect against invasive disease only. However, it is clear that both vaccines do have an impact on carriage and transmission but this may be short term. Models of transmission would need to rely on carriage studies and such studies are not easy to perform. Therefore, the models are not yet sophisticated enough to establish the required level of coverage for these organisms.18

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e Also referred to as herd immunity.
The immunisation levels required for population immunity are dependent on several factors including demographics and, to some extent, the age of the recipients. In the case of measles, the vaccine has an efficacy level of 90 to 95 per cent. It is estimated that for population immunity, immunisation uptake in the UK must be around 92 to 95 per cent. Whereas, for India it is about 99 per cent. Furthermore, for measles the figures often quoted are uptake levels of 85 to 90 per cent for pre-school to secondary school aged children. This is because as children get older they are more likely to come into contact with a greater number of people.

If immunisation coverage falls below that required for population immunity, epidemics can ensue. Parents should be made aware that there are disadvantages, not only for their own children but also for other children and vulnerable adults, if the percentage of unvaccinated children rises. High levels of immunisation within a community protect those who live in that community. Non-immunised children pose a greater risk to the community than immunised children. It can be argued that if a small minority of parents decide not to have their children vaccinated, it is unlikely to alter significantly the level of population immunity and the chance of susceptible individuals contracting infectious disease. According to this argument, the community cannot insist that all children are immunised, even to protect vulnerable persons. However, it can also be argued that if the percentage of children immunised drops by a little then the level is reduced to below that needed for population immunity, and the likelihood of epidemics increases. This raises the question of whether vaccinations should be made compulsory (refer to sections on Rights and choices p13 and Should vaccination be made compulsory? p16).

The current risk of infection to immunised children from a non-immunised child is very low. Therefore, it can be argued that if parents are worried about their child contracting a disease the best option would be to have that child vaccinated, rather than insist on compulsory immunisation for all. However, immunisation does not guarantee a protective immune response and there will be some groups that, for whatever reason cannot be immunised (for example, children with inherited or acquired immunodeficiency such as that caused by leukaemia) and are therefore more vulnerable. In addition, young babies who are otherwise healthy would be at much greater risk if population immunity fell. This is because they do not get their first vaccinations until they are a few months old and do not get the first dose of MMR until around their first birthday, as some vaccines are not effective at a very young age. Also children who are not breastfed, and/or go to nurseries and playgroups at a very young age will have very little or no immunity. Society has a responsibility to protect these children.

**Risks of vaccine-preventable disease versus risks of vaccine**

This report outlines potential adverse effects of childhood diseases and their vaccines. For further details on causes, symptoms and treatment of childhood diseases and available vaccinations (those used in the UK, their side effects and contraindications) please refer to the texts listed in appendix III.

People in general have a lower acceptance of reactions to products given to healthy persons (eg vaccines) compared with those which follow treatment given to ill people (eg cancer chemotherapy). When a parent is deciding on whether or not to vaccinate their child they need to weigh the risks of the disease against the risks of the vaccine. For all childhood vaccine-preventable diseases, the risk of complications with the natural infections is very much greater than the risk of a serious adverse reaction following the vaccine. It can be difficult for parents to appreciate the risks of not vaccinating as many will not have experienced the disease and its manifestations or met someone who has. Therefore, parents may underestimate the risk of not immunising and overestimate the risk associated with the vaccine.

A number of reviews, such as that conducted by the Centers for Disease Control and Prevention in Atlanta, USA, have published information on the risks of adverse events following vaccination and on the risks of complications or adverse events after contracting the disease itself (appendix IV). For example, it is estimated that one in 5,000 people with rubella will experience encephalitis, whereas it occurs in fewer than one in every million doses of the MMR vaccine.

For the purposes of this document ‘parent’ means any parent or guardian who has the legal right or responsibility to make decisions for the benefit of the child.
Contraindications to vaccinations are uncommon and most children in whom there is a true contraindication will already be under the care of a paediatrician. For example, many vaccinations will not be given to a child who is suffering from an acute illness, until the child has fully recovered. When a child has had a reaction to a vaccine that is severe enough to contraindicate further doses, the Committee on Safety of Medicines is notified.

**Safety of vaccines**

Vaccines are recommended to the government on the advice of the JCVI. Vaccine use is licensed and monitored by the Medicines and Healthcare products Regulatory Agency (MHRA), with safety checks carried out by the National Institute for Biological Standards and Control (NIBSC), the UK’s official medicines control laboratory. The JCVI collects data from all over the world. MMR, for example, is the vaccine of choice for immunisation against measles, mumps and rubella in 90 countries. An extensive national and international network of specialists provide advice based on decades of experience of running highly effective national vaccination programmes which have successfully eradicated smallpox and controlled diseases such as polio, diphtheria, pertussis and some forms of meningitis. These professionals have a responsibility to protect children’s health. They include the National Health Service (NHS) and HPA doctors and nurses, paediatricians and immunologists, and organisations like the World Health Organisation (WHO) and UK professional bodies such as the Royal College of General Practitioners (RCGP) and the Royal College of Paediatrics and Child Health (RCPCH).

**Vaccine production**

Before a vaccine is introduced, the following factors have to be considered:

- is the disease common and/or serious?
- is a safe and effective vaccine available?
- is the vaccine acceptable to those receiving it and, in the case of childhood vaccines, to parents and carers?
- can enough people in the target group be immunised to make the vaccination programme effective?

Only when satisfactory answers have been given to these questions can the new programme go ahead. This means that before a vaccine is licensed for use, it must undergo a long period of development and research, taking on average 12 years. This usually includes two to four years of preclinical testing, five to seven years of clinical testing and up to a further two years before it is licensed (NB: if the product is to be used in children it will always be trialled in children). Before the vaccine is released, each batch goes through extensive quality control and safety testing by the NIBSC. Prelicensure trials cannot usually provide data on rare reactions that have a prevalence of less than one per 1,000 doses, have an onset delayed for 30 days or more after vaccination, or occur in subpopulations. Therefore, once a vaccine has been licensed, safety continues to be monitored by the MHRA and the Committee on Safety of Medicines (CSM). Healthcare professionals are expected to report suspected reactions to medicines to the MHRA on a voluntary basis. This has proved to be very successful, but can mean that not all adverse events are reported. Therefore, more reliable methods are currently being investigated such as sentinel reporting by hospitals and record linkage studies.

Virtually all new vaccines in use today are made by commercial companies. The costs, including clinical trials, are paid for by the manufacturers. It is desirable that the doctors who perform clinical trials are independent rather than employees of the company. It is therefore standard practice that agreements with sponsoring companies exclude the researchers from financial gain.

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\[g\] Formerly known as the Medicines Control Agency, the MHRA is the executive agency of the Department of Health. It safeguards public health by ensuring that all medicines on the UK market meet appropriate standards of safety, quality and efficacy.
Additives
Chemicals are often used to make vaccines as safe and effective as possible. They function as preservatives to stop the growth of bacteria, as stabilisers to improve shelf life, or as adjuvants to help the vaccine work more effectively (Hib vaccine does not work at all without an adjuvant). There is no evidence that any additives have caused harm, although some parents are concerned that mercury in some childhood vaccines may have adverse effects.

Thiomersal contains 49.6 per cent mercury and has been used as a preservative in very small amounts in vaccines since the 1930s as it prevents bacterial and fungal contamination. The USA National Institute for Health currently states that there is insufficient information to either support or refute the proposal that thiomersal in vaccines causes neurological problems. The possibility exists that vaccination of newborn babies, particularly those who have a low birth weight, with repeated doses of thiomersal-containing vaccines, may result in levels of mercury that are above the recommended guidelines. Theoretically such infants may be at risk of adverse effects from mercury. Thiomersal is being phased out as a precautionary measure, although it is accepted there is no evidence that it has caused harm in the amount contained in vaccines.

Public concern
Public concern about whether vaccines have been thoroughly tested prior to general release has had an effect on the risk tolerance of parents and healthcare professionals. When deciding on how to react to a vaccine safety scare, all concerned must balance the potential risks against the known risks of not vaccinating. Decisions must also be made quickly as new information becomes available. Freed and others advocate a stronger mechanism to anticipate and address vaccine safety concerns in a manner that would engender public confidence. Unsubstantiated immunisation concerns can cause marked decreases in childhood immunisation uptake rates and a consequential increase in vaccine-preventable diseases. Those entrusted with public policy regarding vaccines must strive to avoid inappropriate erosion of public confidence and act in the best interests of the populations they serve.

Despite extensive research, vaccines, like all pharmaceutical products, are not entirely risk-free. Therefore, it is imperative that ongoing surveillance programmes are in place to monitor vaccine safety. Methodological difficulties associated with the study of rare, delayed or insidious vaccine safety allegations, combined with antivaccine lobbyists and media eagerness for controversy, means that vaccine safety concerns are likely to remain prominent.

On a more distant horizon, vaccine safety research combined with improved surveillance, genetic epidemiology, statistical modelling and advances in immunology may permit better characterisation of groups at risk of vaccine reactions. When integrated with immunisation registries for both children and adults, this characterisation may ultimately offer better prospects for preventing vaccine-induced diseases, and at the same time lower the incidence of vaccine preventable diseases.

Combining vaccines
Some of the vaccines in the National Schedule are given in combinations, such as DTP-Hib or MMR. Others are given singly but at the same time as combined vaccines. For example, the vaccines for MenC and polio (which is itself a combination of three types of polio and thus vaccinates against these three types) are given at the same time as the DTP-Hib vaccine. As more vaccines are added to the schedule, combination vaccines can reduce the number of injections that a child must have and reduce the time during which they are not fully immunised.

Public concern about the effect on the immune system of giving a number of vaccines simultaneously and the possible long term effects such as asthma has not been substantiated by the available evidence. In a double blind randomised controlled trial involving 9,829 children, three quarters were given the DTP vaccine containing one of three different types of pertussis vaccine. The other quarter were given DT vaccine only. There were no significant differences between groups in the proportions of children with wheezing, itchy rash, or sneezing at two and a half years old.

After birth, infants are continually exposed in an uncontrolled manner to a range of naturally occurring antigens. The number of antigens contained in combination vaccines is small compared with the number normally encountered every day. Researchers from the HPA found that there is no evidence that MMR vaccine causes immune system overload and hence an increased risk of serious infection. Furthermore, they found that MMR even seemed to protect children against the risk of unrelated pneumonia.

The DTP vaccine and the MMR vaccine were introduced in the UK in 1961 and 1988 respectively. Further combination vaccines have been developed more recently such as DTwP-Hib (whole cell pertussis) and DTaP-Hib (acellular pertussis). In summary, there is no evidence that multiple antigens cause adverse effects on the immune system even though millions of people have been exposed to such vaccines over many years. Despite the lack of evidence that combination vaccines are harmful, it is still necessary to demonstrate that the individual components work, are effective and confirm that they have no harmful effects in combination.

**Measles, mumps and rubella**

MMR contains three separate vaccines in one injection. It protects children against measles, mumps and rubella (German measles). The argument for a combined vaccine is that it provides the best possible protection against these three diseases. It is given to children as soon as possible after their first birthday and again before they go to school. The second dose protects the majority of those who did not respond to the first dose. From 1980 to 1989, 126 deaths in England and Wales were directly associated with measles.

MMR vaccine was introduced in 1988, and there were only four deaths between then and 1996. However, parental concern about the safety of MMR has meant that by February 2002, the MMR immunisation rate in British two year olds had dropped to 84 per cent, well below the 95 per cent needed for population immunity.

**Autism and irritable bowel disorders**

Parental concern about MMR arose as a result of press coverage following the publication of a paper by Wakefield and others in the *Lancet* in 1998. The authors speculated about a possible link between MMR and autism and/or inflammatory bowel disease (IBD). It is salutary to remember that this study actually stated ‘We did not prove an association between MMR vaccine and the syndrome described’ and none of the studies conducted since have found a link. Furthermore, only one of the 13 authors of the paper published in the *Lancet* has suggested, through the media but not in any published papers, that MMR should be given as three separate injections at least a year apart.

The overwhelming evidence is that there is no proven link between MMR vaccine and autism or IBD. No peer reviewed, scientifically valid research has supported Wakefield and colleagues’ findings and there remains no proven link between MMR and autism or IBD. In 1998, in response to concerns about MMR vaccine, the Chief Medical Officer (CMO) in England asked the Medical Research Council (MRC) to consider the available data regarding a possible link. The group concluded that there was no evidence of any link. In 2000, another expert group convened by the MRC again concluded that there was no evidence to support a causal link. In 1999, a study was published in the *Lancet*, reviewing the cases of nearly 500 children born in north London between 1979 and 1994 who had been diagnosed with autism. The authors examined possible associations between their condition and the MMR vaccine. The study found:

- no increase in autism associated with the introduction of MMR in 1988
- no difference in age of diagnosis of autism between MMR immunised and unimmunised children
- no difference in MMR immunisation rates between children with autism and the rest of the population
- no link between the timing of MMR and the onset of autism.

Furthermore, a study involving almost all children born in Denmark between 1991 and 1998, concluded that there was no increase in the risk of autistic disorder or other autistic spectrum disorders among vaccinated children as compared with unvaccinated children. Specifically, they found no association between the development of autistic disorder and the age of vaccination, the interval since vaccination, or the timing of the vaccination. Other studies have also failed to show any causal link between MMR vaccine and autism. In addition, the BMA believes that recent research indicating a link between the MMR vaccine and an increase in neurological disorders is methodologically flawed and therefore does not alter the balance of evidence.
The BMA understands that parents are concerned about MMR and that the media coverage has done nothing to reassure them. The BMA believes that the triple vaccine is the most effective way to immunise a child against measles, mumps or rubella. To date there has been no conclusive research that has found evidence of a causal link between MMR and autism (12 March 2002, Dr Bill O’Neill, Scottish Secretary, BMA).

Single vaccines versus triple MMR vaccine

WHO advises against single vaccines for measles, mumps and rubella. There are no health benefits over MMR and a number of reasons why they are not the best option.

- Single vaccines are less safe than MMR because they leave children vulnerable to disease for longer (vaccination takes longer to complete when single vaccines are administered). Government health departments would rightly be criticised if they knowingly offered a less safe option.
- In general, fewer children complete the course of injections when single vaccines are used, although some private clinics claim to have high completion rates.
- Giving vaccines separately to children has never been properly tested. The effectiveness of the regime has not been confirmed, the order in which vaccines should be given has not been defined, and the optimal interval between doses is not known. The measles, mumps and rubella vaccines have never officially been given separately in the UK. The measles vaccine was introduced in 1967 for all children. The rubella vaccine was introduced three years later for adolescent girls only. The mumps vaccine was first introduced as part of the combined MMR vaccine in 1988 and has never been recommended as a single vaccine.

The BMA does not believe that single vaccines are the solution as this would leave more children unprotected for extended periods and raise the likelihood of epidemics.

On 30 January 2003, the Global Advisory Committee on Vaccine Safety (GACVS) concluded that there was no evidence to support the routine use of monovalent measles, mumps and rubella vaccines. In the committee’s view, this strategy would put children at increased risk of incomplete immunisation and thus there should be no change in current vaccination practices with MMR. They further concluded that ‘no evidence exists of a causal association between MMR vaccine and autism or autistic disorders’.

No country in which MMR is available, recommends vaccination for measles, mumps and rubella with three separate vaccines. Some single vaccines are available in some European countries, where they may be used in special circumstances. For example, in France the measles vaccine is given to children aged nine to 12 months who attend nursery schools. These children usually go on to have MMR six months later and another dose before school. The single rubella vaccine is available and licensed for use in the UK for specific reasons, notably the protection of non-immune women of child bearing age, but single vaccines for mumps and measles are only available on a ‘named-patient’ basis and are imported from Europe. Single vaccines for mumps and measles are usually only prescribed by general practitioners (GPs) in private practice settings and to meet ‘special needs’.

The MHRA allows importation of vaccines not licensed in the UK if there is a ‘special clinical need’. For example:

- to allow completion of a course of single vaccines that had been previously started
- a known allergy to one or more of the ingredients of the licensed product. As indicated earlier, vaccines include ingredients such as preservatives and adjuvants in addition to the active substance.

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i GACVS was established in 1999 by WHO to respond promptly, efficiently, independently (of WHO), and with scientific rigour to vaccine safety issues of potential global importance.

j Import of unlicensed medicines: notifications of intention to import under the medicines (standard provisions for licences and certificates) amendment regulations (SI 1999 No 4).
As a result of controversy over MMR, there has been a drop in immunisation coverage for measles, mumps and rubella, and this has led to fears of epidemics. In some areas there have been outbreaks such as the measles outbreak in 2000-02 in London where there were a total of 90 confirmed cases. Furthermore, in Ireland there were 332 confirmed cases of mumps between November 1999 and August 2000, and of these, 316 (just over 95 per cent) were in the nine to 19 age group. Initial analysis of the 316 cases noted that 41 per cent had never received MMR vaccine, 58 per cent had one dose of MMR, and only one per cent had received two doses of MMR.

Arguments against vaccination based on misconceptions

There are a number of reasons why some people do not wish to have their children vaccinated or are concerned about immunisations. The first six reasons given below are considered by WHO to be the six main misconceptions about vaccination.

(i) **Diseases had already begun to disappear before vaccines were introduced, because of better hygiene and sanitation.**

Better sanitation and hygiene, as well as improved nutrition, have undoubtedly reduced the incidence and severity of disease, but immunisation programmes have reduced this further. For example, vaccination has dramatically reduced the incidence of measles cases in the UK. Since the MMR vaccine was introduced in the UK in 1988, the number of suspected cases of measles has fallen from between 50,000 and 100,000 cases per year to less than 10,000. The number of deaths from acute measles has also fallen from an average of 13 per year to only four deaths between 1988 and 1996. Statistics for other vaccine-preventable diseases show a major reduction in disease incidence. The effectiveness of vaccines is also illustrated very well by the example of pertussis in Japan.

(ii) **The majority of people who get diseases have been vaccinated, ie vaccines are not very effective.**

No vaccine is 100 per cent effective and for reasons specific to the individual, not all vaccinated persons develop immunity. In countries such as the UK, those who are vaccinated vastly out number those who are not. Outbreaks of vaccine-preventable disease occur when there are sufficient numbers of non-immune persons to enable ready transmission of the infection. In most outbreaks, the majority of those who get the disease are usually people who have not been vaccinated and only a small minority are individuals for whom the vaccine was ineffective (for efficacy levels of vaccines see appendix V). In some outbreaks, however, vaccinated individuals can account for a higher proportion of outbreak cases than those who are not vaccinated, thus giving the appearance that the vaccine is ineffective. This is best illustrated using the example given in the WHO report on misconceptions about vaccination:

‘In a high school of 1,000 students, none has ever had measles. All but five of the students have had two doses of the measles vaccine, and so are fully immunised. The entire student body is exposed to measles, and every susceptible student becomes infected. The five unvaccinated students will be infected, of course. But of the 995 who have been vaccinated, we would expect several not to respond to the vaccine. The efficacy rate for two doses of the measles vaccine can be as high as more than 99 per cent. In this case, seven students do not respond, and they, too, become infected. Therefore, seven out of 12, or about 58 per cent of cases occur in students who have been fully vaccinated.’

(iii) **There are batches of vaccine that have been associated with more adverse events and deaths than others. Parents should find the numbers of these batches and not allow their children to receive vaccines from them.**

The concept of a ‘bad batch’ is incorrect. If an adverse event is recorded this does not mean that the other doses of vaccines drawn from that batch will cause the same effect. Reviewing published lists will not help parents identify the best or worst vaccines for their children. If the number and type of adverse event reports for a particular vaccine batch suggested that it was associated with more serious adverse events or deaths than are expected by chance, the UK has a system which results in the whole batch being recalled. Refer to section on Safety of vaccines, p7, for more details.

k A full copy of these misconceptions and their explanations can be found at:
www.cdc.gov/nip/publications/6mishome.htm
(iv) **Vaccines cause harmful side effects, illnesses, and even death – not to mention possible long term effects that we are unaware of.**

Most known side effects of vaccines are minor and can often be controlled (for example, giving paracetamol for fever); more serious and/or long term side effects are very rare. On the other hand, the known adverse effects of the disease are usually very serious (see section on Risks of vaccine-preventable disease versus risks of vaccine on p6). Details of the safety checks that vaccines go through are given in Safety of vaccines p7. For a discussion of research conducted in relation to MMR refer to Single vaccines versus triple MMR vaccine, p10.

(v) **Vaccine-preventable diseases have been virtually eliminated from my country, so there is no need for my child to be vaccinated.**

Vaccination programmes are to protect both those who are vaccinated and those around them, particularly those who are vulnerable and cannot be vaccinated, for example, immunocompromised individuals. For the population to be protected, immunisation coverage should reach and remain above the level required for population immunity (see section on Population immunity on p5). While the incidence of the disease may be low in the UK, the rise in travel may increase the frequency that diseases are brought into the country and if vaccine coverage is insufficient an outbreak could follow. Measles spreads rapidly; if vaccination was stopped worldwide, it is estimated that 2.7 million people would die from measles each year.

(vi) **Giving my child multiple vaccinations for different diseases at the same time increases the risk of harmful side effects and can overload the immune system.**

Children are exposed to many foreign antigens every day. There is no evidence to suggest that a baby’s immune system cannot cope with a number of antigens at one time. The evidence also fails to demonstrate a link between the use of vaccines and the development of asthma or allergies. An additional advantage of combination vaccines is that children will have fewer injections. Combination vaccines such as DTP have been in use for many years and have proven to be safe and effective. For more information refer to Combining vaccines, p8.

It is important to immunise children when they are very young as this is when they are at their most vulnerable. In fact, some studies have shown that the side effects are less severe when first immunisations are given to babies at two, three and four months rather than in later life. Although, some vaccines will not be effective at such a young age.

Other reasons why parents refuse to immunise

(vii) **Religious beliefs.**

Some groups refuse immunisation on religious or philosophical grounds. This can have very serious consequences. For example, in Holland, an outbreak of 2,961 cases of measles, with three fatalities and an almost 20 per cent incidence of serious complications, occurred in 1999-2000 in communities who refused vaccination for religious reasons. National coverage of MMR vaccine in the Netherlands is 96 per cent, but only 3 per cent of the 2,961 cases had been vaccinated.

(viii) **Some parents believe that immunisation will adversely affect their child’s immune system so may prefer other approaches such as homeopathy.**

The Faculty of Homeopathy acknowledges that there is no evidence that homeopathy can prevent a child from becoming infected with a disease that is preventable by vaccination or that it can reduce the severity of the disease. Therefore, it recommends the use of conventional vaccines.

(ix) **Belief that because of population immunity the risk to their child is very small.**

For further information refer to Population immunity, p5.

(x) **Belief that the child has had the disease, therefore there is no need to have the vaccine.**

A history of apparently having had the disease in the absence of laboratory confirmation is not a reason for refusing to have the vaccine. For example, many viral infections can present with a similar rash to measles or rubella. Furthermore, some diseases do not fully protect against subsequent infections. Notified cases of measles are now followed up with salivary testing. The vast majority of these cases (in whom a presumptive diagnosis of measles has been made on clinical grounds) prove to be false positives. Therefore, it is recommended that a vaccine is given for almost all diseases, even if
there is definite confirmation that the child has had the disease, the exceptions being TB, Hep A and Hep B.\(^5\)

**(xi) Concern about the preparation of the vaccine material.**

When the rubella vaccine was developed, the rubella virus was grown on tissue that originated from an aborted foetus, the abortion having been performed for medical reasons.\(^5\) Vaccine production today does not involve foetal material. Leading religious authorities, such as the Roman Catholic Church, consider it ethical to use the rubella vaccine. Also, parents can be reassured that vaccines used for the UK childhood immunisation schedule do not contain bovine material or human albumin. However, a few measles vaccines may be attenuated using human diploid cell culture\(^57\) (embryonic not foetal) and some mumps vaccines using human embryo fibroblast cultures.\(^59\) These cell cultures are cloned stable cell lines (ie immortalised), rather than being primary cultures that have to be continually replenished with new cells which could necessitate continued embryo and foetal material having to be made available. The latter case could pose more ethical questions for some patients.\(^7\)

Some vaccines, such as measles, contain traces of hens’ eggs. Some parents are concerned that this could cause a severe reaction in children who are allergic to eggs. However, there is increasing evidence that MMR vaccine can be given safely to children even when they have previously had an anaphylactic reaction following food containing egg. The data indicate that over 99 per cent of children who are allergic to eggs can safely receive MMR vaccine. Dislike of egg, or refusal to eat it, is not a contraindication. If there is concern, paediatric advice should be sought with a view to immunising under controlled conditions such as admission to hospital as a day case.\(^7\)

**(xii) The experience of emotional distress at the prospect of inflicting pain on the baby.**

Parents need help and advice so they can weigh up the advantages of immunisation over the emotional distress of giving permission for their child to have an injection. Parents should be made aware of the potential distress and danger if their child contracts a disease because they had not been vaccinated. Although most infections are mild, for some children the consequences will be serious. Families then have the additional distress of knowing that those probably could have been avoided.

### Rights and choices

In liberal societies, most decisions concerning individual children’s welfare are rightly left to families. What has been problematic for parents with regard to MMR, is apparently conflicting information in the media. Although it is generally agreed that vaccination provides both individual and communal benefits, the benefit to a non-immunised individual of becoming vaccinated declines as the percentage of vaccinated people in a population increases. Furthermore, in a situation where there is high immunisation coverage within a population leading to very low incidence of the infection, vaccination’s attendant harms, such as side-effects, can seem more substantial.

Bradley\(^20\) has considered the case for and against compulsory immunisation and has attempted to define the duties of healthcare professionals. Such professionals should consider whether children’s rights to basic care override parents’ rights to choose.\(^20\) He states that, ‘Healthcare professionals cannot justify compulsory immunisation for children against parents’ wishes, purely in terms of the consequences that their actions yield. Parents can be wronged if their wishes are ignored and usually their wishes should be considered overriding. However, if children are considered to be in danger of being harmed significantly, their wellbeing is the primary concern’. He concludes that when the balance of benefits and risks is less obvious, it is much harder to argue that a child has the right to vaccination.

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In 2001, the BMA supported a Scottish Parliamentary report calling for more research on autism, and while arguing in favour of the MMR vaccine, also said ‘it is imperative to recognise the rights of parents to choose’.

The parental right to rear is based on a duty of parents to care for their children to an acceptable level. It can be argued that if they fail to care for their children, they relinquish the right to rear.\(^8\) However, society does not intervene if parents are not raising their children to ‘an acceptable level’ but only if...
parents’ actions constitute some form of abuse or harmful neglect.\(^1\) There is no consensus that failure to vaccinate is a form of neglect with current levels of risk.\(^2\) This is because administration of a vaccine is never immediately life-saving, except in the case of post-exposure rabies vaccine\(^5\) and smallpox vaccine. However, vaccination does satisfy ethical criteria for preventative interventions in children: it is effective, minimally invasive, and associated with significant societal benefits.\(^6\) Article 3 of the UN convention on the rights of the child states that any decision or action affecting children and young people, either as individuals or as a group, should be focused on their best interests.\(^7\)

As the majority of immunisation programmes in the UK involve children, they also raise complex questions about the limits of the rights of parents to make healthcare choices on their behalf. These and a variety of other questions were discussed by the BMA’s medical ethics committee in the spring of 2002 in the context of the debate over the MMR vaccine. Following discussion, a number of basic principles were agreed. They are given below.

- The ethical debate over the MMR vaccine hinges on the clinical evidence. Clinical benefits and harms can be assessed by objective methods and these necessarily provide part of the basis for ethical deliberation.
- Generally speaking, doctors have a therapeutic role and are primarily concerned with the wellbeing of individual patients. Occasionally however, the needs of the wider society come to the fore. In these circumstances the issues need to be considered on a case-by-case basis.
- Doctors have a duty to help patients gain access to the most effective treatments identified on the basis of evidence-based criteria. They also play an important role in public education.
- The government and public health physicians have obligations to maximise public health and ensure that accurate information is provided to the public.
- Individual autonomy deserves respect up to the point at which other people are harmed, and claims based upon individual choice have to be balanced against public health needs and resource considerations.
- Parents are accountable both to society and to their children for the decisions they make on their children’s behalf, and there is a limit to the risk to which parents can expose their children. However, parents are usually the best people to make decisions for children and society needs strong evidence of harm before overriding parents’ decisions.
- Individuals have duties to the broader community, however, [in this context] the fulfilment of such duties can only be encouraged, it cannot be enforced.
- The concept of ‘risk’ needs to be better communicated to, and better understood by, the public. In addition to these broader principles, it was agreed that patients have general rights to choose inferior treatments if they wished, but there was not necessarily an attendant duty on society to fund them. The government had a duty to optimise the use of scarce public resources and could not justify funding suboptimal treatments.\(^8\)

**Consent**

In most primary care trusts (PCTs), there is a policy on how consent is obtained for the immunisation programmes. A written invitation is sent to parents for each individual vaccination and consent is obtained from the parent initially and at each clinic visit. In routine circumstances, a child legally may not be vaccinated until a parent has consented to the procedure.\(^9\) This legal view considers that the parents’ rights to decide on behalf of their children override healthcare professionals’ duties of care. Healthcare professionals need to judge whether interventions benefit children sufficiently to justify acting against the wishes of the child’s parents.\(^7\) Competent children can give consent for medical

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1 Society also intervenes in another scenario, namely where a parent or guardian requests a decision in respect of issues relating to a child’s care and that may not be based on abuse or harmful neglect but rather a dispute regarding another aspect of the child’s life, for example what school he/she should attend. A court may intervene in circumstances in respect of such decisions relating to benefit of a child, where there is dispute by those with parental responsibility in relation to the care of that child.
procedures, however, this report is concerned with vaccinations given to children up to the age of five years.

Written consent provides a permanent record, but consent – either written or verbal – is required at the time of each immunisation after the child’s fitness and suitability have been established. Seeking consent is a process, not a single event. Providing information (as discussed below) is part of that process. Information should include advice about likely risks and benefits and be provided in a way the recipient can understand. Doctors should also respond to questions honestly and as fully as the individual requires. Consent should only be sought after the patient (or patient’s parent) has had an opportunity to consider the information and come to a decision. Only where a doctor is satisfied that the patient has been given all the necessary information and has had time to reach a settled decision, would implied consent be acceptable. Even in these circumstances, it would be good practice to ask for confirmation of consent, orally or in writing.

For more detailed discussion, please refer to Consent, rights and choices in healthcare for children and young people. This book from the BMA’s medical ethics committee offers comprehensive, practical guidance on the ethical and legal issues which arise in the healthcare of patients under 18 years of age. The guidance covers the legal position in England, Wales, Northern Ireland and Scotland, and is essential reading for healthcare professionals involved in the care of children. www.bma.org.uk

Right of access to unbiased information
Parents have a right to receive unbiased information so that they can make an informed choice with regard to the vaccination of their children. Even if vaccines were to be made compulsory they would still have a right to access this kind of information.

It has been difficult for parents to decide what is best when some apparently conflicting information is presented in the media and in the medical press. The media has a big impact on risk communication. Public opinion is not formed by detailed coverage of individual reports or viewpoints or by the particular spin put on a story, but by repeated associations and by weight of coverage. For example, in the case of MMR, long term media coverage of controversy over the vaccine led the public to associate MMR with autism. Researchers found that most people (67 per cent) knew that some scientists had linked MMR with autism. However, they also thought that the evidence in favour of such a link was evenly balanced, or that the evidence even favoured a link, whereas most of the published science and official advice denies the existence of any link.

Healthcare professionals have a duty to ensure that up-to-date, accurate and evidence-based information is available to parents. In this way, each family can make an informed assessment of the relative risks known to be associated with the various options, including the risks arising from doing nothing. Parents need medical information, which is objective, balanced and politics-free.

Right to a choice of vaccine
In the NHS there is rightly a heavy emphasis on respecting patient views, encouraging patient autonomy in decision-making, providing choice, and providing balanced information about the pros and cons of treatments. It is important that these principles are upheld.

It can be argued that parents have the right to choose the type of vaccine used, for example, single doses versus the triple vaccine in the case of MMR. As previously mentioned, there is not necessarily an attendant duty on society to fund them. However, it could be argued that it is better for government to provide a less effective vaccine which many parents nevertheless prefer and will use, rather than take the risk that children will go unvaccinated altogether. This is not an argument that the BMA can subscribe to.

Others are concerned about the ethical standards applied to the production of vaccines (see point (xi) p13) and the use of preservatives such as mercury (see p8). As argued earlier, the available evidence

m For more information on risk communication and public health please refer to: Bennett P & Calman K (eds) (1999) Risk communication and public health, Oxford University Press.
does not substantiate any concerns. If claims were confirmed, there would still be no moral reason for opting for single vaccines over combined vaccines.

When considering the right to a choice of vaccine one must also recognise that healthcare professionals have a duty of care to provide the most effective treatment to their patients.

**Should vaccination be made compulsory?**

Compulsory immunisation has been widely debated in the public domain ever since vaccination was first used in the 18th century. The volume of this debate has increased as a result of controversy about the possible link between the MMR vaccine and autism, and the subsequent drop in population immunity levels. It is argued that compulsory vaccinations could increase the number of those immunised and hence the likelihood of reaching the levels required for population immunity. Whether or not vaccination is made compulsory depends on a number of factors including benefits and costs, attitudes and beliefs, ethical and legal considerations, and public and political perceptions (some of which have been discussed in the section on Rights and choices, p13).

Individuals will benefit from immunisation, on average, if the chance of developing morbidity/mortality from the disease before immunisation, significantly outweighs the chance of developing morbidity/mortality after the vaccination (including any side effects of the vaccination). It cannot, however, be guaranteed that a particular individual will benefit (but by the same token, no treatment can be guaranteed). In the extreme, if everyone were immunised against meningococcal C disease, for example, there would be no benefit for subsequent children to be vaccinated, as the disease would have been eliminated and any risk from vaccination would be unacceptable. However, this situation is highly unlikely (see section on Why vaccinate, p2).

Even though vaccination in the UK is not compulsory, levels of immunisation are generally very high, but are affected by public opinion regarding the risks of side effects. Some suggest that compulsory vaccination cannot be justified in the UK in view of the high levels of population immunity which currently exist. For example, Scandinavia has among the highest rates of vaccination in the world, yet there is no compulsion. However, the opposite reasons are given with regard to making the wearing of cycle helmets compulsory for example, ie high compliance is needed to make compulsion more acceptable and more enforceable.

In response to the controversy regarding the MMR vaccine, the Scottish Executive agreed to establish an Expert Group to consider the matters raised by the Health and Community Care Committee relating to immunisation against measles, mumps and rubella’. As part of their work the group considered compulsory immunisation and concluded that ‘such a policy is not consistent with key elements of the frameworks of principles for immunisation policy. On a practical level, it is not self-evident that it would lead to higher levels of immunisation. More substantively, it runs counter to the Experts Group’s core principle that vaccines should be administered on a voluntary basis.’ It can be argued that education, not compulsion, is the key to high immunisation coverage. The BMA fully endorses this principle.

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If immunisations were to be made compulsory this would require legislation to ensure compliance. In the unlikely event that legislation was introduced, there would be questions as to how it would be enforced and policed. This report is confined to those aspects of mandatory childhood immunisation that are most relevant to GPs and other healthcare professionals when discussing vaccinations with patients.
Survey of public opinion on compulsory immunisation

The Peckham Report surveyed healthcare professionals (1,147 GPs, 522 health visitors, 28 paediatricians, 88 clinical medical officers), and 3,325 parents of two year old children. They were asked: ‘Do you think children without contraindications should be required by law to have their immunisations against diphtheria, tetanus, polio and measles before starting school? (strong objectors could opt out)’. The results are given in table 3. The main reason given for objection was the removal of freedom of choice.

Table 3: Those who agreed with compulsory immunisation for some vaccinations

<table>
<thead>
<tr>
<th>Group</th>
<th>Per cent</th>
</tr>
</thead>
<tbody>
<tr>
<td>GPs</td>
<td>51</td>
</tr>
<tr>
<td>Health visitors</td>
<td>58</td>
</tr>
<tr>
<td>Paediatricians</td>
<td>29</td>
</tr>
<tr>
<td>Clinical medical officers</td>
<td>30</td>
</tr>
<tr>
<td>Parents</td>
<td>53</td>
</tr>
</tbody>
</table>

UK policy on compulsory vaccination

All immunisations in the UK are voluntary. Determining the factors that contribute to vaccination compliance is essential to the success of implementing future vaccination programmes. Across Europe the trend has been toward greater voluntary participation. Countries such as Germany, where compulsion was the rule a couple of decades ago, now rely on voluntary acceptance. Even though vaccination in the UK is not compulsory, some pre-schools/nurseries refuse entry if children are not fully vaccinated. In March 2003, the Department of Health issued the following statement, ‘None of the childhood vaccinations available in the UK are compulsory. They are offered on a voluntary basis. There are no plans to alter this policy’.

Policies on immunisation (particularly MMR) from the UK government, Royal Colleges and WHO can be found in appendix VI.

Policy on compulsory vaccination outside the UK

Several countries have some form of compulsory immunisation, either in general or for entrance to nursery/school. However, most countries such as these have exemption clauses that can allow people with philosophical/ethical/religious objections, to decide not to immunise their children. A number of factors can influence the decision on whether to have compulsory vaccinations, for example the rights of citizens in different countries. The following countries have a policy on various aspects of compulsory immunisation:

**MMR**

- compulsory: Barbados, the Czech Republic
- semi-compulsory (if you want to go to school): Canada, USA, Belgium
- measles compulsory: Singapore, France (if the child goes to nursery)
- rubella compulsory for girls: India, Kuwait

**Other**

- **USA:** Laws which require school children to be immunised against tetanus exist in 47 out of 50 states. All 50 states require children entering day care to be immunised against tetanus. In all states, children must have proof of immunisation or immunity to certain infectious diseases, including whooping cough, before they start school. However, parents can opt out of immunisation on ideological or religious grounds.
- **Italy:** Compulsory vaccinations for children are required against the following diseases: polio, diphtheria/tetanus, and hepatitis B virus (HBV). Children must have proof of immunisation before they can go to school. However, compulsory vaccination has not been enforced for many years.
• **Canada**: Immunisation cannot be made mandatory because of the Canadian Constitution. Only three provinces have legislation or regulations under their Health Protection Acts to require proof of immunisation for school entrance. Two provinces require proof for diphtheria, tetanus, polio, measles, mumps, and rubella immunisation and the third requires proof only for measles. Exceptions are permitted in these three provinces on medical or religious grounds and reasons of conscience. Legislation must not be interpreted as to imply compulsory immunisation. Requiring proof of immunisation for school entrance serves two main purposes. Firstly, parents who have forgotten to have their children properly immunised will be reminded and can rectify the situation. Secondly, parents who do not wish their child to be immunised must actively refuse and sign documents attesting to that fact. Also, all provinces and territories have regulations that allow for the exclusion of unvaccinated children from school during outbreaks of vaccine-preventable diseases.

• **Australia**: Vaccination is not compulsory, but various incentives and reminders aim to promote it. Firstly, payment of maternity allowance at 18 months and the childcare benefit requires up-to-date vaccination (unless there are contraindications, serologically confirmed immunity or conscientious objection). Secondly, at school entry, documentation of full vaccination is required in most Australian jurisdictions.

**What advice should UK healthcare professionals give to their patients?**

Medical practitioners have a key role to play in providing advice to parents that is objective and based on the best available evidence; and that is openly and fully discussed. Inadequate parental knowledge and possible side effects of vaccines are issues that must be addressed by healthcare professionals, including doctors, nurses and health visitors. One of the key issues is to ascertain the parents’ specific concerns and ensure that they have all the information they need. For example, parents need to know which vaccines are to be administered, what protection they offer, common side effects, and the risks involved in regard to any rare or severe side effects. This will enable them to make an informed decision without feeling pressurised.

GPs and practice nurses encounter parents who have difficulty in deciding who they can trust most in coming to a decision on how best to protect their child. Some parents understand the risks involved in not having their children vaccinated while others believe that the diseases themselves pose little threat (particularly when compared to the perceived risks associated with MMR vaccine). A study in Australia found that 23 per cent of parents/carers attending a clinic to get vaccinations for their children, had no knowledge regarding the vaccinations that their child was receiving and the disease for which the vaccination was administered. Their results emphasised that even those who comply with immunisation schedules have limited knowledge.

Active listening in consultations can be valuable in helping parents make informed choices about immunisation. It can help them to put their fears in perspective without the healthcare professional appearing to deny the authenticity of such feelings. Healthcare professionals should be able to gauge how much support or information a parent requires and at the same time instil confidence in the vaccination. Different parents will have different needs and fears, but all parental concerns should be treated seriously and sympathetically.

Many people in the UK will not have first hand experience of the infectious diseases in question. Therefore, parents must rely on their healthcare providers for information about the need for vaccines. More emphasis must be placed on information about vaccines, their properties and proper use, and the diseases that they prevent. It is vital that the healthcare professionals administering the vaccines have access to, and adhere to, the best practice recommendations when carrying out the procedure to ensure that the vaccine has optimal efficacy and the child experiences minimal discomfort.

District Immunisation Coordinators, are consultants who run or organise Special Immunisation Advisory Clinics in every PCT in the UK. GPs and nurses can refer parents and their children to this service to get more expert opinion regarding immunisation matters. Appendix VII contains a list of organisations, such as support/help groups, to which doctors may wish to refer their patients if they may have had bad experiences as a result of a vaccination.
In 2001, the *British Journal of General Practice* carried out a focus group study to investigate what influences parents’ decisions on whether to accept the primary MMR immunisation and the impact of the recent controversy over its safety. They concluded that parents wanted up-to-date information about the risks and benefits of MMR to be available in advance of their immunisation appointment. Some parents did not have confidence in the recommendations of healthcare professionals because they were aware that GPs needed to reach targets. Most parents would, however, welcome more open discussion about immunisation with healthcare professionals.

In February 2002, MORI interviewed a representative quota sample of 1,001 adults aged 16 and over across Great Britain about whether they trust today’s scientists.

- 37 per cent of those surveyed were concerned about the MMR vaccine (74 per cent and 70 per cent were concerned about biological weapons and global warming respectively).
- When asked ‘do the media present science in a responsible way?’ 47 per cent disagreed but 39 per cent agreed.
- 71 per cent of the public look to scientists to give an ‘agreed view’ about science issues and 61 per cent expect science to provide 100 per cent guarantees on the safety of medicines.
- Doctors were the most trusted group on MMR (69 per cent).

**Advice for parents on using the internet**

The internet is a huge source of information to which members of the public have ready access. In the USA, 55 per cent of adults with internet access use it to seek health related information. However, there is great concern that much of the information relating to health that is available on the internet may not always be accurate. Anyone searching for vaccination information on the internet will rapidly encounter numerous dubious sites, many of which masquerade as official sites.

Davies et al have recommended that the following checklist be given to parents in order for them to discern whether an internet source is trustworthy:

- is the content highly emotive?
- are conspiratorial claims made?
- does it refer to privately published material, such as newspaper articles?
- does it claim to have privileged information unknown to medical authorities?

If the answer to any of these questions is ‘yes’ then the site may not be presenting unbiased and substantiated advice.

The internet represents a great potential for the public to make informed as well as uninformed decisions about vaccination. Where medicine is unable to provide a culprit for many idiopathic disorders, antivaccinationists can fill the void, providing answers and solidarity for many parents who feel abandoned by medical authorities.
Conclusion

Vaccinations have drastically reduced mortality and morbidity throughout the world. Despite all the efforts of the world community, two million children still die every year from vaccine-preventable diseases. Yet, immunisation coverage is levelling off in many countries and falling in others. In the UK, there appears to be a worrying trend of a decrease in vaccination coverage (particularly for MMR).

Public health policies depend on social consensus. The UK government currently recommends a national immunisation schedule (table 1) which is not compulsory. The recent controversy over MMR has highlighted the difficulties that can arise when consensus about the value of vaccination is disturbed by anxieties about vaccine safety. This places an additional burden on healthcare professionals dealing with parents of children due for immunisation. All healthcare professionals have a vital role to play in educating the public about the benefits of immunisation and the balance between benefit and risk, both to the individual child and to society. They can help provide parents with a reliable, evidence-based and objective source of information, enabling parents to make informed choices about immunisation.

The BMA remains firmly of the view that vaccination is the safest and most effective way of preventing infectious diseases. We endorse and support the childhood immunisation programme currently recommended in the UK. We recognise that there will always be some concern about the safety of vaccines, but are in no doubt that the vaccines currently recommended are safe and that their use is for the greater good of individuals and society. We consider that healthcare professionals should continue to encourage parents to choose vaccination for their children and to use the schedules currently recommended as national UK policy.

Objective judgement with regard to vaccines and their safety demands the continued accumulation and maintenance of a robust evidence base. Healthcare professionals have an obligation to use this evidence base in their dealings with parents and children, and have a responsibility not to generate inappropriate anxiety on the part of parents. We note with interest that some other countries operate immunisation policies where there is some degree of compulsion. We do not believe that compulsory immunisation is in any way appropriate for the UK but that healthcare professionals should strive to inform, educate and advise the public about the overwhelming benefits of vaccination for their children and society in general.
Glossary

**Active immunity** is achieved when an appropriate antigen stimulates immune cells to produce antibodies.6

**Adjuvant**: In order to enhance the antibody response to the antigen and prolong the stimulatory effect, some inactivated vaccines contain adjuvants. These are most commonly derived from minerals, oily materials, or derivatives of certain microorganisms. Examples are aluminium phosphate and aluminium hydroxide.6

**Antigen** is a substance which, under appropriate conditions, triggers an immune response. Vaccines are specially prepared antigens.

**Communicable disease** is any disease that is transmissible by infection directly or through the agency of a vector.7

**Conjugate vaccines** contain bacterial capsular polysaccharide joined to a protein to enhance immunogenicity.86

**Contraindication** is a reason why a vaccine should not be given.87

**Efficacy** is a measure of a vaccine’s effectiveness. It is measured by the proportion of those immunised who do not get a disease when exposed to it, or by the number of antibodies produced by the immune system.87

**Immunisation** is a technique used to induce immune resistance to a specific disease by exposing the individual to an antigen in order to raise antibodies to that antigen.85

**Infectious disease** is a disease resulting from the presence and activity of a microbial agent.85

**‘Named-patient’ basis**: some vaccines or immunoglobulins that have not been submitted to the UK authorities for licensing or that have not obtained a licence, can be made available on a ‘named-patient’ basis. In legal terms, supply of a product under this provision renders ultimate liability for its use with the prescribing physician.

**Passive immunity** is achieved by the introduction of preformed protective antibodies.84

**Population immunity** is the state achieved when immunisation of individuals achieves sufficiently high coverage to interrupt transmission within the community. In this way, both immunised and non-immunised individuals benefit. Population immunity is the basis on which most national immunisation programmes are designed (population immunity does not apply to tetanus as it cannot be passed from person to person).85

**Thiomersal** is a mercury based preservative used in some vaccines to prevent microbial contamination, or in the process of producing inactivated vaccines.87

**Vaccination** is the introduction of a vaccine into the body for the purpose of inducing immunity. Coined originally to apply to the injection of smallpox vaccine, the term has come to mean any immunising procedure in which a vaccine is administered.88 Vaccinations have been used mainly in two ways: on an individual basis to protect specific persons at risk, and on a population basis to provide ‘population immunity’, which is important in combating infectious disease.

**Vaccines** consist of an antigen, that elicits production of protective antibody; a suspending fluid, which may include materials derived from the system used to produce the vaccine; preservatives to prevent bacterial contamination or stabilise the antigen; and sometimes adjuvants that amplify the immunogenic effect.

**Variolation** involves the introduction of material from smallpox crusts into scarified areas of the skin, usually the arm. The recipient would develop a mild form of the disease and then be afforded some protection against it.6
Websites providing further information on immunisation

These websites are suggested for further information only and this does not suggest an endorsement of their content in any way by the BMA. Furthermore, the BMA can make no warranty, expressed or implied, as to the accuracy of any information or advice provided by external sources for which links are provided here. The views of other organisations do not necessarily reflect those of the BMA.

On-line journals and search facilities
- **National Electronic Library for Health (NeLH)**: the role of the NeLH is to provide healthcare professionals and the public (through NHS Direct Online and the New Library Network) with knowledge and know-how to support healthcare related decisions. www.nelh.nhs.uk (For a discussion on evidence for and against MMR go to www.nelh.nhs.uk/hth/mmr_evidence1.asp)
- **Sciencenet**: this contains information on science. www.sciencenet.org.uk
- **British Medical Journal (BMJ)**: the BMJ publishes original scientific studies, review and educational articles, and papers commenting on the clinical, scientific, social, political and economic factors affecting health. www.bmj.com

Surveillance data
- **Health Protection Agency (HPA), England**: protects the population from infection by detecting, diagnosing, and monitoring communicable diseases through a network of microbiology laboratories, epidemiology and field investigation services, research, development, education and training programmes. www.hpa.org.uk
- **Health Protection Agency (HPA), Wales**: www.cdsc.wales.nhs.uk
- **Scottish Centre for Infection and Environmental Health (SCIEH)**. www.show.scot.nhs.uk/scieh/main.html
- **Communicable Disease Surveillance Centre (CDSC), Northern Ireland**: www.cdscni.org.uk
- **World Health Organisation (WHO)**: provides vaccine and immunisation surveillance data. www.who.int/vaccines-surveillance/
- **European Surveillance**: a site that has peer reviewed information on communicable disease surveillance and control. www.eurosurv.org
- **The International Network of Paediatric Surveillance Units**: an independent international body which allows individual paediatric surveillance units across the world, such as the British Paediatric Surveillance Unit (BPSU), to be able to compare and share data about rare childhood diseases. bpsu.inopsu.com

Websites for information about MMR
- **Department of Health (DoH)**: provides MMR advice. www.doh.gov.uk/mmr.htm
- **Immunisation**: a comprehensive website on childhood immunisation. www.immunisation.org.uk
- **10 Downing Street**: a government site containing a section devoted to MMR. www.pm.gov.uk
- **Sense**: provides information on the risks of rubella to the unborn child. www.sense.org/sensory_impairment/rubella.html

Websites for the public
- **NHS Direct Online**: the NHS gateway to public health information on the internet. www.nhsdirect.nhs.uk
- **Vaccination**: the aim of this website is to inform with simple facts about the different diseases, their corresponding vaccines/vaccinations and the risks attached to both. www.vaccination.co.uk
- **World Health Organisation**: www.who.int
- **Immunisation**: NHS website that gives easy to follow details on why we vaccinate, the diseases and the vaccines. Provides information for parents on vaccination and has downloadable factsheets on most of the routine vaccines. www.immunisation.org.uk
- **Department of Health**: www.doh.gov.uk
- **Doctor Patient Partnership (DPP)**: the DPP is a UK charity, its health education campaigns and initiatives consistently promote positive and balanced messages to the public and healthcare professionals. The DPP has produced a booklet called *Caring for kids: a self-care guide to childhood ailments*. It contains information on measles, mumps and the MMR vaccine (including details of the risks posed if the MMR vaccine is not given). www.dpp.org.uk
- **BUPA**: British United Provident Association is a global health and care organisation. www.bupa.co.uk
- **Justice Awareness and Basic Support (JABS)**: promotes awareness and provides information to help parents make informed decisions about immunisation. It offers support to parents who believe their children have a health problem following immunisation. www.jabs.org.uk
- **Meningitis Research Foundation**: is a national registered charity which aims to achieve a world free from meningitis and septicaemia. www.meningitis.org
- **The Meningitis Trust**: produces an extensive range of information to raise awareness of the disease. It funds research into vaccines and treatment, and offers a wide range of support for people affected by meningitis and meningococcal septicaemia. www.meningitis-trust.org.uk

**Websites for a professional audience**

- **Royal College of General Practitioners (RCGP)**: the academic organisation in the UK for general practitioners. Its aim is to encourage and maintain the highest standards of general medical practice and act as a ‘voice’ of general practitioners on education, training and standards issues. www.rcgp.org.uk
- **Royal College of Paediatrics and Child Health (RCPCH)**: the main objectives of the college are to advance the art and science of paediatrics, improve standards of medical care to children, and to educate and examine doctors in paediatrics. www.rcpch.ac.uk
- **Royal College of Midwives (RCM)**: a professional organisation run by midwives for midwives. www.rcm.org.uk
- **Faculty of Public Health Medicine**: an organisation which aims to promote the advancement of knowledge in the field of public health medicine and to develop public health medicine with a view to maintaining the highest possible standards of professional competence and practice. www.fphm.org.uk
- **Community Practitioners’ and Health Visitors’ Association**: a UK site containing vaccine specific information. www.msfcphva.org/index.html
- **UK Vaccine Industry Group**: aims to promote the positive benefits of vaccination as a key element in improving the health of the nation. It represents the UK vaccine industry to all interested parties. www.uvig.org
- **Aventis Pasteur MSD**: this company supplies a comprehensive range of vaccines to meet the health needs of all the population. www.apmsd.co.uk
- **Immunisation Gateway**: an independent, detailed, up-to-date electronic reference book on immunologic drugs by US author John Grabenstein. www.immunofacts.com
- **Global Alliance for Vaccines and Immunization (GAVI)**: GAVI is a coalition of global leaders in immunisation, formed in response to stagnating global immunisation rates and widening disparities in vaccine access among industrialised and developing countries. Since 1999 the alliance has provided a mechanism for partners to collaborate more closely, agree upon common goals and strategies, and share a commitment to do more for immunisation, and to do it better. www.vaccinealliance.org
- **The American Academy of Paediatrics (AAP)**: AAP is an organisation dedicated to the health, safety and wellbeing of children, adolescents and young adults. www.aap.org
- **Children’s Vaccination Programme**: a charity run by Bill and Melinda Gates which promotes worldwide equal access to new vaccines. www.childrensvaccine.org
- **Committee on the safety of medicines**: advises the UK Licensing Authority to ensure that medicines meet the standards of quality, efficacy and safety the public and healthcare professionals would expect. www.mca.gov.uk/aboutagency/regframework/cms/cmshomemain.htm
- **Medicines and Healthcare products Regulatory Agency (MHRA)**: the agency of the Department of Health that safeguards public health by ensuring that all medicines on the UK market meet appropriate standards of safety, quality and efficacy. www.mhra.gov.uk
- **Joint Committee on Vaccination and Immunisation (JCVI)**: the JCVI is an independent expert advisory committee which was first set up in 1963. Its Terms of Reference are: ‘To advise the Secretaries of State for Health, Scotland, Wales and Northern Ireland on matters relating to communicable diseases, preventable and potentially preventable through immunisation’. www.doh.gov.uk/jcvi/
- **Immunisation against infectious disease (1996), or The Green Book**: is now available on line with links to more up-to-date sources of information. www.doh.gov.uk/greenbook/
Appendix I: Reduction in mortality and disease incidence after introduction of immunisation in the UK

### Diphtheria

<table>
<thead>
<tr>
<th>Year of vaccine introduction to the UK</th>
<th>Before/just after vaccine introduced</th>
<th>After immunisation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Year</td>
<td>Deaths</td>
</tr>
<tr>
<td></td>
<td>1939</td>
<td>2,480</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
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</tbody>
</table>

### Tetanus

<table>
<thead>
<tr>
<th>Year of vaccine introduction to the UK</th>
<th>Before/just after vaccine introduced</th>
<th>After immunisation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Year</td>
<td>Deaths</td>
</tr>
<tr>
<td></td>
<td>1956-61</td>
<td></td>
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<tr>
<td></td>
<td></td>
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</tbody>
</table>

### Pertussis

<table>
<thead>
<tr>
<th>Year of vaccine introduction to the UK</th>
<th>Before/just after vaccine introduced</th>
<th>After immunisation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Year</td>
<td>Deaths</td>
</tr>
<tr>
<td></td>
<td>1953</td>
<td>1952</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
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</tr>
</tbody>
</table>
## Haemophilus influenzae type b

<table>
<thead>
<tr>
<th>Year of vaccine introduction to the UK</th>
<th>Before/just after vaccine introduced</th>
<th>After immunisation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Year</td>
<td>Deaths</td>
</tr>
<tr>
<td>1992</td>
<td>1992†</td>
<td>21†</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
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<td></td>
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</tr>
</tbody>
</table>

## Poliomyelitis

<table>
<thead>
<tr>
<th>Year of vaccine introduction to the UK</th>
<th>Before/just after vaccine introduced</th>
<th>After immunisation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Year</td>
<td>Deaths</td>
</tr>
<tr>
<td>1961</td>
<td>1970-84</td>
<td>70†</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
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<tr>
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<td></td>
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</tbody>
</table>

## Measles

<table>
<thead>
<tr>
<th>Year of vaccine introduction to the UK</th>
<th>Before/just after vaccine introduced</th>
<th>After immunisation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Year</td>
<td>Deaths</td>
</tr>
<tr>
<td>1967</td>
<td>1968†</td>
<td>90†</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
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<td></td>
<td></td>
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<td></td>
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</tbody>
</table>
**Mumps**

<table>
<thead>
<tr>
<th>Year of vaccine introduction to the UK</th>
<th>Before/just after vaccine introduced</th>
<th>After immunisation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Year</td>
<td>Deaths</td>
</tr>
<tr>
<td>1982</td>
<td>1987†</td>
<td>3†</td>
</tr>
<tr>
<td></td>
<td>1989†</td>
<td>1†</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

This vaccine was introduced as part of MMR in 1988

**Rubella**

<table>
<thead>
<tr>
<th>Year of vaccine introduction to the UK</th>
<th>Before/just after vaccine introduced</th>
<th>After immunisation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Year</td>
<td>Deaths</td>
</tr>
<tr>
<td>1970 (single)</td>
<td>1989†</td>
<td></td>
</tr>
<tr>
<td>1988 (MMR)</td>
<td></td>
<td></td>
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<td></td>
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</tbody>
</table>

Rubella has been notifiable since 1988 (the single vaccine was introduced in 1970, and then it was introduced as part of MMR in 1988)

**Meningococcal serogroup C**

<table>
<thead>
<tr>
<th>Year of vaccine introduction to the UK</th>
<th>Before/just after vaccine introduced</th>
<th>After immunisation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Year</td>
<td>Deaths</td>
</tr>
<tr>
<td>1999</td>
<td>1997†</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

† England and Wales only  
‡ England and Wales only, these include deaths and notifications for all types of meningococcal infection (A, B & C)  
* Provisional data  
CRS: congenital rubella syndrome  
When there is no information the data is unavailable

### Appendix II: Immunisation coverage for two year olds in the UK

**Percentage of children immunised by their second birthday in England (financial year)**

<table>
<thead>
<tr>
<th>Year of second birthday</th>
<th>Diphtheria</th>
<th>Tetanus</th>
<th>Polio</th>
<th>Pertussis</th>
<th>Hib</th>
<th>MMR</th>
<th>MenC</th>
</tr>
</thead>
<tbody>
<tr>
<td>1993-94</td>
<td>95.3</td>
<td>95.8</td>
<td>95.3</td>
<td>92.6</td>
<td>75.1</td>
<td>90.8</td>
<td>n/a</td>
</tr>
<tr>
<td>1994-95</td>
<td>94.8</td>
<td>94.8</td>
<td>94.8</td>
<td>92.8</td>
<td>91.5</td>
<td>91.0</td>
<td>n/a</td>
</tr>
<tr>
<td>1995-96</td>
<td>95.7</td>
<td>95.7</td>
<td>95.6</td>
<td>93.7</td>
<td>94.2</td>
<td>91.9</td>
<td>n/a</td>
</tr>
<tr>
<td>1996-97</td>
<td>95.7</td>
<td>95.7</td>
<td>95.7</td>
<td>94.2</td>
<td>95.1</td>
<td>91.5</td>
<td>n/a</td>
</tr>
<tr>
<td>1997-98</td>
<td>95.5</td>
<td>95.6</td>
<td>95.5</td>
<td>94.2</td>
<td>95.1</td>
<td>90.8</td>
<td>n/a</td>
</tr>
<tr>
<td>1998-99</td>
<td>95.2</td>
<td>95.3</td>
<td>95.2</td>
<td>94.1</td>
<td>94.9</td>
<td>88.3</td>
<td>n/a</td>
</tr>
<tr>
<td>1999-00</td>
<td>94.8</td>
<td>94.9</td>
<td>94.8</td>
<td>93.6</td>
<td>94.4</td>
<td>87.6</td>
<td>n/a</td>
</tr>
<tr>
<td>2000-01</td>
<td>94.5</td>
<td>94.5</td>
<td>94.5</td>
<td>93.6</td>
<td>94.1</td>
<td>87.4</td>
<td>85.0*</td>
</tr>
</tbody>
</table>

Sources: Health Protection Agency (England)

**Primary vaccination annual uptake rates at 24 months, Scotland**

<table>
<thead>
<tr>
<th>Year</th>
<th>Diphtheria</th>
<th>Tetanus</th>
<th>Polio</th>
<th>Pertussis</th>
<th>Hib</th>
<th>MMR</th>
<th>MenC</th>
</tr>
</thead>
<tbody>
<tr>
<td>1998</td>
<td>97.3</td>
<td>97.3</td>
<td>97.3</td>
<td>96.1</td>
<td>97.0</td>
<td>92.7</td>
<td>n/a</td>
</tr>
<tr>
<td>1999</td>
<td>97.4</td>
<td>97.5</td>
<td>97.5</td>
<td>96.5</td>
<td>97.2</td>
<td>92.7</td>
<td>n/a</td>
</tr>
<tr>
<td>2000</td>
<td>97.6</td>
<td>97.7</td>
<td>97.6</td>
<td>97.0</td>
<td>97.5</td>
<td>93.2</td>
<td>n/a</td>
</tr>
<tr>
<td>2001</td>
<td>97.5</td>
<td>97.5</td>
<td>97.5</td>
<td>96.7</td>
<td>97.3</td>
<td>88.5</td>
<td>93.7</td>
</tr>
</tbody>
</table>

Source: Scottish Centre for Infection and Environmental Health

**Completed primary immunisation by 24 months, Northern Ireland**

<table>
<thead>
<tr>
<th>Year</th>
<th>Diphtheria</th>
<th>Tetanus</th>
<th>Polio</th>
<th>Pertussis</th>
<th>Hib</th>
<th>MMR</th>
<th>MenC</th>
</tr>
</thead>
<tbody>
<tr>
<td>1996</td>
<td>96.9</td>
<td>96.9</td>
<td>96.7</td>
<td>94.7</td>
<td>96.5</td>
<td>92.4</td>
<td>n/a</td>
</tr>
<tr>
<td>1997</td>
<td>96.8</td>
<td>96.8</td>
<td>96.8</td>
<td>94.9</td>
<td>96.6</td>
<td>92.5</td>
<td>n/a</td>
</tr>
<tr>
<td>1998</td>
<td>96.4</td>
<td>96.5</td>
<td>96.3</td>
<td>95.1</td>
<td>96.3</td>
<td>90.2</td>
<td>n/a</td>
</tr>
<tr>
<td>1999</td>
<td>96.6</td>
<td>96.6</td>
<td>96.5</td>
<td>95.4</td>
<td>96.5</td>
<td>90.5</td>
<td>n/a</td>
</tr>
<tr>
<td>2000</td>
<td>96.6</td>
<td>96.6</td>
<td>96.5</td>
<td>95.7</td>
<td>96.7</td>
<td>91.9</td>
<td>n/a</td>
</tr>
<tr>
<td>2001</td>
<td>96.7</td>
<td>96.8</td>
<td>96.6</td>
<td>95.8</td>
<td>96.9</td>
<td>89.9</td>
<td>89.4</td>
</tr>
</tbody>
</table>

Source: Communicable Disease Surveillance Centre (Northern Ireland)

**Completed primary immunisation by 24 months, children resident in Wales (financial year)**

<table>
<thead>
<tr>
<th>Year</th>
<th>Diphtheria</th>
<th>Tetanus</th>
<th>Polio</th>
<th>Pertussis</th>
<th>Hib</th>
<th>MMR</th>
<th>MenC</th>
</tr>
</thead>
<tbody>
<tr>
<td>1995-96</td>
<td>96.8</td>
<td>96.8</td>
<td>96.9</td>
<td>92.5</td>
<td>96.1</td>
<td>92.1</td>
<td>n/a</td>
</tr>
<tr>
<td>1996-97</td>
<td>96.3</td>
<td>96.4</td>
<td>96.4</td>
<td>93.0</td>
<td>95.7</td>
<td>90.8</td>
<td>n/a</td>
</tr>
<tr>
<td>1997-98</td>
<td>96.3</td>
<td>96.4</td>
<td>95.8</td>
<td>93.3</td>
<td>95.8</td>
<td>90.0</td>
<td>n/a</td>
</tr>
<tr>
<td>1998-99</td>
<td>95.7</td>
<td>95.8</td>
<td>96.1</td>
<td>93.1</td>
<td>95.4</td>
<td>85.7</td>
<td>n/a</td>
</tr>
<tr>
<td>1999-00</td>
<td>95.9</td>
<td>96.0</td>
<td>96.6</td>
<td>93.7</td>
<td>95.7</td>
<td>85.3</td>
<td>n/a</td>
</tr>
<tr>
<td>2000-01</td>
<td>96.5</td>
<td>96.6</td>
<td>95.4</td>
<td>94.5</td>
<td>96.3</td>
<td>87.7</td>
<td>79.9</td>
</tr>
<tr>
<td>2001-02</td>
<td>95.3</td>
<td>95.4</td>
<td>95.4</td>
<td>93.8</td>
<td>95.0</td>
<td>83.6</td>
<td>92.0</td>
</tr>
</tbody>
</table>

Source: Communicable Disease Surveillance Centre (Wales)
Appendix III: Texts on immunisation

The 1996 edition of this book is now available on the Department of Health (DoH) website (www.doh.gov.uk/greenbook/). Where possible, links have been provided next to the chapter headings for more up-to-date sources of information.

This textbook, now into its fourth edition, is mainly for those working within the field of immunisation, particularly primary care.

This book is intended mainly for doctors and nurses in primary care. As well as describing the vaccines, it also provides information about the storage of vaccines and the organisation of immunisation programmes within a practice.

Major reference work on vaccines.
Appendix IV: Risks of the disease versus risks of the vaccine

### Diphtheria

<table>
<thead>
<tr>
<th>Diphtheria</th>
<th>Diphtheria Vaccine</th>
</tr>
</thead>
<tbody>
<tr>
<td>About 1 in 10 people who get diphtheria dies from it (pneumonia, respiratory failure, heart failure). Case fatality changed little in 50 years.</td>
<td>Swelling and redness at injection site common; may get localised nodule at injection site – usually disappears.</td>
</tr>
<tr>
<td>Toxin release causes myocarditis and neuritis.</td>
<td>Hypersensitivity reaction may occur especially in those with multiple prior boosters.</td>
</tr>
<tr>
<td>Tonsillitis, pharyngitis, membrane formation can cause dysphagia, respiratory obstruction. Oedema causes respiratory obstruction, coma and death.</td>
<td>Malaise, transient fever and headache may occur.</td>
</tr>
<tr>
<td></td>
<td>Rarely generalised urticaria, anaphylaxis or neurological complications reported.</td>
</tr>
</tbody>
</table>

### Pertussis

<table>
<thead>
<tr>
<th>Pertussis Complications (%)</th>
<th>Pertussis Vaccine (% 1st DTP)</th>
<th>(%2nd DTP)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pneumonia 9.5 (17 in infants &lt; 6mths)</td>
<td>Sore spot 25</td>
<td>Sore spot 9</td>
</tr>
<tr>
<td>Convulsions 1.4</td>
<td>Cry &gt; 3hrs 0.4</td>
<td>Cry &gt; 3 hrs 0.04</td>
</tr>
<tr>
<td>Encephalopathy 0.2</td>
<td>High fever 0.24</td>
<td>High fever 0.04</td>
</tr>
<tr>
<td>Death 0.2</td>
<td>Convulsions 0.02</td>
<td>Convulsions 0.007</td>
</tr>
<tr>
<td>Hospitalisation 0.2</td>
<td>Acute limpness 0.07</td>
<td></td>
</tr>
</tbody>
</table>

### Tetanus

<table>
<thead>
<tr>
<th>Tetanus</th>
<th>Tetanus Vaccine</th>
</tr>
</thead>
<tbody>
<tr>
<td>30% mortality, increased in the elderly. Causes ‘lockjaw’.</td>
<td>Pain and redness at site may persist for several days – nodules at injection site may persist for several weeks.</td>
</tr>
<tr>
<td>Uncontrollable muscle spasm can cause spinal or long bone fractures.</td>
<td>Hypersensitivity reaction occasionally reported with extensive swelling elbow to shoulder, more often in adults who have received frequent doses of tetanus toxoid.</td>
</tr>
<tr>
<td>Other complications include hypertension, cardiac arrythmias, aspiration pneumonia, pulmonary embolii and coma.</td>
<td>General reactions (headache, lethargy, malaise, myalgia (muscle pain) and high temperature) uncommon.</td>
</tr>
<tr>
<td></td>
<td>Acute anaphylaxis and urticaria may occasionally occur and very rarely peripheral neuropathy.</td>
</tr>
</tbody>
</table>
### Haemophilus Influenzae (Hib)

<table>
<thead>
<tr>
<th>Hib Disease</th>
<th>Hib Vaccine</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prior to vaccine in 1992, Hib caused 1/3 of cases of bacterial meningitis.</td>
<td>Hib vaccine is one of the safest of all vaccines and has dramatically reduced the number of cases of Hib in the UK.</td>
</tr>
<tr>
<td>Affected 1 in 600 children under 5.</td>
<td>Swelling, redness and/or pain in 5-30% recipients, usually resolves within 12-24 hours.</td>
</tr>
<tr>
<td>60% of cases: Hib meningitis with 3-4% fatality and 15-30% serious sequelae including deafness, convulsions and intellectual impairment.</td>
<td>About 1 in 50 get a fever.</td>
</tr>
<tr>
<td>40% of cases: epiglottitis, osteomyelitis, arthritis, cellulitis, pneumonia and septicaemia.</td>
<td>Swelling and redness at site of injection in up to 10%, usually resolves within 24 hours.</td>
</tr>
</tbody>
</table>

### Polio

<table>
<thead>
<tr>
<th>Polio Vaccine</th>
<th>Acquired Polio</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.1-10% of cases associated with paralysis depending on age at which infected.</td>
<td>1 in 1.4 million 1st doses – less likely with 2nd/3rd dose.</td>
</tr>
<tr>
<td>5-10% mortality associated with paralytic cases.</td>
<td>1 in 2 million contacts of a vaccinated child can get polio but not if they have been immunised. Can be avoided by strict hygiene measures post-vaccine.</td>
</tr>
</tbody>
</table>

### Measles

<table>
<thead>
<tr>
<th>Measles</th>
<th>MMR Vaccine</th>
</tr>
</thead>
<tbody>
<tr>
<td>All get rash and fever</td>
<td>5% get rash or 5-15% fever at 7-12 days lasting 1-2 days</td>
</tr>
<tr>
<td>1 in 20 get ear infections, diarrhoea</td>
<td>1 in 2,000 get ear infections</td>
</tr>
<tr>
<td>6 in 100 get pneumonia</td>
<td>1 in 1,000 are hospitalised</td>
</tr>
<tr>
<td>18 in 100 are hospitalised</td>
<td>1 in 3,000 are hospitalised with a febrile convulsion</td>
</tr>
<tr>
<td>1 in 1,000 get encephalitis</td>
<td>&lt;1 in 1,000,000 get encephalopathy</td>
</tr>
<tr>
<td>2 in 1,000 will die from it</td>
<td>Joint symptoms 25% (adult women)</td>
</tr>
<tr>
<td>5-10 in a million get subacute sclerosing panencephalitis (SSPE)</td>
<td>Thrombocytopenia &lt;1 in 30,000 doses</td>
</tr>
</tbody>
</table>
### Mumps

<table>
<thead>
<tr>
<th>Mumps</th>
<th>Mumps Vaccine</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fever, headache, swollen salivary glands in 30-40%.</td>
<td>Serious reactions from mumps vaccine are extremely rare – mini mumps.</td>
</tr>
<tr>
<td>Was one of the main causes of acquired deafness in children, 1 in 20,000 cases reported.</td>
<td>Central nervous system reactions including deafness rarely reported (1 in a million doses).</td>
</tr>
<tr>
<td>1 in 10 get meningitis, resolves in 3-10 days. Encephalitis rare (&lt;2/100,000).</td>
<td>Swollen salivary glands and fever reported rarely.</td>
</tr>
<tr>
<td>1 in 4 teenage and adult males get a painful swelling of the testicles (50% get some degree of testicular atrophy, but sterility is rare).</td>
<td>Very rare neurological signs but no long term effects (meningitis 1 in 50,000 to 1 in a million doses).</td>
</tr>
<tr>
<td>Deaths 1-3 in 10,000 in recent years in the USA.</td>
<td></td>
</tr>
</tbody>
</table>

### Rubella

<table>
<thead>
<tr>
<th>Rubella</th>
<th>Rubella Vaccine</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rash, low fever, swollen glands.</td>
<td>5-10% low grade fever and rash.</td>
</tr>
<tr>
<td>Joint problems (arthralgia or arthritis) in adult females in up to 70%.</td>
<td>Up to 40% of susceptible adult females (&gt;25) have transient arthralgia after rubella vaccine.</td>
</tr>
<tr>
<td>1 in 3,000 get thrombocytopenic purpura (gastrointestinal, cerebral or intrarenal haemorrhage may occur).</td>
<td>Thrombocytopenia &lt;1 in 30,000.</td>
</tr>
<tr>
<td>1 in 5,000 get encephalitis.</td>
<td>Encephalopathy &lt;1 in 1,000,000 doses (MMR).</td>
</tr>
<tr>
<td>Congenital rubella syndrome in up to 85% of infants infected in the first trimester of pregnancy – causes deafness, cataracts, heart defects, microcephaly, mental retardation, liver and spleen damage, diabetes.</td>
<td></td>
</tr>
</tbody>
</table>

## Appendix V: Efficacy of vaccines

<table>
<thead>
<tr>
<th>Vaccine</th>
<th>Efficacy (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diphtheria</td>
<td>87-96</td>
</tr>
<tr>
<td>Tetanus</td>
<td>&gt;90</td>
</tr>
<tr>
<td>Pertussis</td>
<td>35-96, recent studies in the UK have shown it to be &gt;90</td>
</tr>
<tr>
<td>Hib</td>
<td>94-100</td>
</tr>
<tr>
<td>Oral Polio</td>
<td>90-100</td>
</tr>
<tr>
<td>Measles</td>
<td>90-95</td>
</tr>
<tr>
<td>Mumps</td>
<td>90-98</td>
</tr>
<tr>
<td>Rubella</td>
<td>&gt;95</td>
</tr>
<tr>
<td>MMR</td>
<td>95</td>
</tr>
</tbody>
</table>


NB: A wide range of efficacies has been reported, depending on the vaccine, conditions of use and the target group (for further data on efficacy see Plotkin and Orenstein (1999), appendix I)
Appendix VI: Statements on MMR

UK Government policy on MMR
‘Evidence from around the world is against any link between MMR and autism or bowel disease. MMR protects children from three illnesses that can be very serious. Single vaccines increase the risk of children contracting one of the diseases.’

Joint Professional Statement
In January 2001, following advice on MMR from the Chairmen of the CSM and the JCVI, a joint statement was issued by the BMA, the Royal College of General Practitioners, the Royal College of Paediatrics and Child Health, the Royal College of Nursing and the Community Practitioners and Health Visitors Association.

‘We welcome this positive statement from the Chairs of these expert committees about MMR vaccine. MMR is a safe and effective vaccine. By contrast, there is a real concern about having the vaccines separately, since children would be left unnecessarily at risk from these potentially serious diseases. We strongly recommend that children are protected with MMR.’

Royal College of General Practitioners (RCGP)
‘The MMR vaccine was first introduced for routine use in 1988. Since then there have been very few cases of measles. Continued success depends on a high level of vaccine uptake – 95 per cent as recommended by the WHO. In recent years the figure has dropped nationally to 88 per cent and in some areas even down to 75 per cent. This fall means measles will come back unless we take urgent steps to increase vaccine uptake. Measles is a serious condition and occasionally children die because of it. In some parts of the world it remains a killer of children.’

‘The RCGP believes it is vitally important that GPs explain to their patients that there is no scientific evidence linking the MMR vaccine to autism and Crohn’s disease. It is not enough to just say “don’t worry the vaccine is safe,” parents need to be given reassurance. Expert committees have assessed the safety of the present vaccine and have come heavily down in favour of routine immunisation of all children well at the time of immunisation. The RCGP supports this policy while stressing patients must be given adequate reassurance.’

Royal College of Paediatrics and Child Health (RCPCH)
In February 2002, the RCPCH made a joint statement with the Faculty of Public Health Medicine, the Public Health Medicine Environment Group and the Community Practitioners and Health Visitors Association endorsing the continued use of the MMR triple vaccine.

‘We have seen no new evidence that would make us change our advice to parents. Our organisations therefore continue to support the policy of the DoH and WHO that parents should continue to immunise their children with the combined triple vaccine for measles mumps and rubella. There is a huge body of evidence that shows that the combined vaccine, which has been given to 500 million children worldwide in 90 countries, remains safe and effective. We note that no country in the world recommends use of single vaccines when MMR is available.’

Royal College of Nursing (RCN)
‘In response to the current media interest in the MMR programme, the RCN reiterates support of this method of immunisation as the best available to parents and children in the United Kingdom.’
Royal College of Midwives (RCM)
Anne-Jackson Baker, Director of the RCM UK Board for England, said: ‘Midwives play a key public health role in reinforcing the health promotion messages that other members of the primary healthcare team are giving to women. It is therefore vitally important that midwives make themselves aware of the evidence about MMR, for they will meet many parents with real concerns and fears about this immunisation. Midwives need information and resources which they can give to people to help them make an informed choice about the MMR immunisation.’ In July 2001 midwives throughout England received an information pack, providing up-to-date information on the MMR vaccine, produced by Health Promotion England and supported by the Royal College of Midwives. Midwives were encouraged to discuss the MMR vaccine with parents.

World Health Organisation (WHO)
WHO maintains a database of immunisation profiles of all member countries, and is thus able to monitor the take up of vaccinations globally and compare this with the number of reported cases. It also monitors adverse reactions.

‘WHO strongly endorses the use of MMR vaccine on the grounds of its convincing record of safety and efficacy. The combination vaccine is recommended rather than monovalent presentation when available and the disease burden justifies its use. There has been no scientific evidence that would suggest impaired safety of MMR. On the contrary, all results from vaccine trials published reaffirm the high safety and efficacy of MMR vaccine.’
Appendix VII: Support groups

A list of organisations to which doctors may wish to refer their patients if they may have had bad experiences as a result of a vaccination.

Justice Awareness and Basic Support (JABS)
JABS aims to promote understanding about immunisations and offer basic support to any parent who believes their child has a health problem after vaccination. www.jabs.org.uk

Meningitis Research Foundation
The Meningitis Research Foundation’s befriending network enables it to put people who have recently been affected by the trauma of meningitis or septicaemia in touch with a trained befriender who has had a similar experience of the disease to their own. It also has a 24-hour helpline. www.meningitis.org

The Meningitis Trust
The Meningitis Trust has been supporting meningitis sufferers and their families since it was founded in 1986. Its services have developed over the years, based upon its experiences of working with people who have come to it for help. It has a 24-hour helpline and a counselling service. www.meningitis-trust.org.uk

Contact a Family
Contact a Family is a UK charity which helps families who care for children with any disability or special need. It is a main source of information about rare disorders and is able to assist affected adults as well as children. www.cafamily.org.uk

The BMA does not by implication endorse these organisations or their views
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   and media interest.
36 Medical Research Council press statement 05.03.01. Medical Research Council to re-examine autism.
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42 Personal communication: Professor Sam Lingam, BMA board of science and education, March 2003.
43 www.van.org.uk/tb/bcg-tb_factsheet.PDF
46 Chen RT
   WB Saunders.
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   *JAMA* 275: 760.
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55 Message from Sir Kenneth Calman, Chief Medical Officer, DoH. 12 March 1998. MMR – parents’ concerns
   and media interest.
56 Medical Research Council press statement 05.03.01. Medical Research Council to re-examine autism.
59 Taylor B et al (2002) Measles, mumps and rubella vaccination and bowel problems or developmental regression in
60 Kaye JA et al (2001) Mumps, measles and rubella vaccine and the incidence of autism recorded by general
62 Personal communication: Professor Sam Lingam, BMA board of science and education, March 2003.
63 www.van.org.uk/tb/bcg-tb_factsheet.PDF
66 Chen RT
   WB Saunders.
   *JAMA* 272: 592-3.
   *JAMA* 275: 760.
74 www.mmrthefacts.nhs.uk
75 Message from Sir Kenneth Calman, Chief Medical Officer, DoH. 12 March 1998. MMR – parents’ concerns
   and media interest.
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91 www.rcgp.org.uk
Joint statement from the: Faculty of Public Health Medicine, RCPCH, Public Health Medicine Environmental Group, Community Practitioners and Health Visitors Association. February 2002. Endorsing the continued use of the MMR triple vaccine.


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WHO statement (25.01.01) Recent concerns regarding MMR vaccine.

NB. All websites cited were accessed between December 2002 and March 2003.
Childhood immunisation: a guide for healthcare professionals

This report from the BMA board of science and education reviews the principles of vaccination and immunisation in children aged 0 to 5 years.

Increased societal concern regarding the safety of vaccines has an impact on the risk tolerance of parents and healthcare professionals. This report is intended to assist general practitioners and other healthcare professionals in discussing the health benefits and potential risks of vaccination with parents so that informed decisions can be made.

Copies of this report can be obtained from:
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A PDF of the report is available on the website: www.bma.org.uk