Measles Rubella Immunisation Campaign in England.

‘One Year On’

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Measles Rubella Immunisation Campaign in England
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1. Summary:

This report provides background to the reasons why the 1994 measles rubella immunisation campaign was necessary, reviews the implementation and provides information on the impact of the campaign in which 6.585 million children were immunised in England. Data for suspected adverse reactions to the measles rubella vaccine are presented for the whole of the UK.

A large measles epidemic had been predicted by independent researchers and action was planned in accordance with the recommendations of the independent Joint Committee on Vaccination and Immunisation; the epidemic has been averted. Laboratory confirmed cases of measles are now exceptionally rare. Early indications suggest a dramatic decline in laboratory confirmed rubella cases in children whose ages were targeted in the campaign.

Most reported adverse reactions were mild and self-limiting: only one child in every 6.700 immunised in the UK was reported to have any adverse reaction whatsoever. Immediate serious adverse reactions were either of an allergic type such as anaphylaxis or were described as convulsions; all these children recovered fully. From the descriptions provided, most of the reported immediate convulsions appeared to be associated with syncope. Later onset neurological reactions were reported at rates no higher than those expected from the background frequency of the illness.

2. Epidemiology:

In 1988, routine immunisation against measles was augmented by the introduction of measles, mumps and rubella (MMR) vaccine. Coverage by the second birthday rose progressively from 76% in 1988 to 92-93% by 1994. At the time of the change-over, MMR vaccine was recommended for those children who were having their pre-school DT and polio boosters, even if they had already had one dose of measles vaccine. As a consequence, many children born between 1983 and 1987 had two doses of measles
Figure 3. Left: Age distribution of notified cases of measles E & W 1993-1994. Right: Age distribution corrected for probability of correct diagnosis for each age band (as above at Fig 2).

In late 1993, based on age specific notification rates, age specific infection rates from laboratory reporting, age specific sero-epidemiology, coverage data and vaccine efficacy data, two independent groups using different mathematical models presented predictions\(^2\)\(^3\) that a large epidemic was likely by 1996/7. The Joint Committee on Vaccination and Immunisation (JCVI) considered this and other evidence, including the experience of other countries, and recommended that a nation-wide school-based immunisation campaign should be carried out. Figure 4 shows the most recent epidemics from three European countries where high levels of immunisation coverage had been achieved but nevertheless after 5 to 7 years, further measles epidemics occurred\(^4\). The reason in each case was a growing accumulation of susceptible individuals who had either not been immunised or who were ‘vaccine failures’.

Figure 4. Intervals between most recent measles epidemics in European countries with high immunisation coverage (WHO data).
and the Netherlands (Figure 4) where there had been measles epidemics despite high coverage, with the age of cases shifted to older groups with higher morbidity and mortality.

A range of strategic alternatives was considered, taking account of the likelihood of achieving the necessary coverage over the time available, and recognising that the use of a short intensive campaign was the most effective way to interrupt measles virus transmission. Target groups for consideration included children aged 1-5 years, primary school aged children (5-11 years), and all school aged children. Options included static regimens - i.e. second doses according to the passing of a particular age point by individual children (5 years or 11 years), or campaigns. Also considered were routes of service delivery for each option, - i.e. primary care services or school health services. Each option and each strategy was costed and tested against the mathematical models\textsuperscript{2,3}.

It was clear to JCVI that the most cost effective use of resources was the implementation of an intensive school health service delivered campaign, targeted at all children aged 5 to 16 years, irrespective of previous history of measles or immunisation. A cost benefit analysis that compared the cost of a campaign with the cost of a measles epidemic was strongly in favour of prevention. A campaign was costed at approximately £20 million (vaccine costs, publicity costs and notional costs for the staff time in providing the service) against the estimated approximate £60 million costs of an epidemic (health care costs and value of lives lost), along with 0.3 million working days lost to the economy from parents’ time off work caring for their ill children. Studies had shown that when children under 5 years have measles, parental time off work is minimal: if the child is over 5, one parent frequently has to take considerable amounts of time off work.

Before the national campaign was implemented, a pilot campaign was undertaken in one district and high coverage was achieved. The experiences from that district were used in the development of the information materials and were available to the advisory group planning the campaign implementation. The staff/service cost per immunised child was £0.83.
been immunised in England. The following table shows the coverages achieved by District Health Authority or NHS Trust.

<table>
<thead>
<tr>
<th>Coverage(%)</th>
<th>DHAs/Trusts (%)</th>
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</thead>
<tbody>
<tr>
<td>&gt;95</td>
<td>37 (21.5)</td>
</tr>
<tr>
<td>90 - 95</td>
<td>96 (55.8)</td>
</tr>
<tr>
<td>85 - 90</td>
<td>31 (18.0)</td>
</tr>
<tr>
<td>80 - 85</td>
<td>6 (3.5)</td>
</tr>
<tr>
<td>&lt;80</td>
<td>2 (1.2)</td>
</tr>
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Mean coverage: 92%  Total: 172

Table 1. Immunisation coverages achieved by DHAs or NHS Trusts.

6. Outcome:

In the autumn of 1994, notifications were rising much as they had before the 1988 epidemic. Within approximately three weeks of the start of the campaign, notifications levelled off, and subsequently have declined.

![Graph showing measles notifications E & W 1987/8 and 1994/5 (CPCS reports).](image)

Figure 5. Measles notifications E & W 1987/8 and 1994/5 (CPCS reports).

Previous experience has demonstrated that measles notification data shows useful trends but individual notifications are highly unreliable, especially in younger
7. Adverse reactions:

7.1 Planning:
Before the start of the campaign, the Post-Licensing Division of the Medicines Control Agency (MCA) agreed that all suspected adverse reactions to MR vaccine would be handled with high priority. Doctors were reminded by the CMO of the importance of reporting all suspected adverse reactions before the start of the campaign. Yellow Card reports were classified and entered into the MCA database within 24 hours of receipt and reviewed by a medical assessor within 36 hours. The MCA database was electronically linked with the measles team database and all reports relating to MR vaccine were transferred on a daily basis. Requests for follow-up information were sent to doctors reporting serious suspected adverse reactions if inadequate information was provided on the Yellow Card.

7.2 Adverse reaction results:
8 million children have been immunised in the UK campaign and the following figures relate to the whole of the UK. These data will change if any further reports are submitted. By the end of October 1995, 2,735 adverse reactions have been reported affecting 1,202 children (more than one reaction was reported in some children), a reporting rate of 1 affected child for approximately 6,700 immunisations. Most of the reports were of minor conditions, many of which were unlikely to be linked to immunisation, or of no likely consequence. The report of a reaction does not necessarily imply that it was caused by the vaccine.

There were no deaths. 530 reports of serious reactions were received. These serious adverse reactions fell into two groups - those occurring immediately or soon after the immunisation and those occurring later.

7.3 Allergic type reactions:
There were 123 reports of immediate allergic type reactions, such as anaphylaxis or bronchospasm. 52% of children with anaphylaxis received adrenaline. Some were admitted briefly to hospital but no serious or long lasting effects are known to have
reported the case of hemiparesis noted that the titre of measles antibodies did not change, implying pre-existing immunity; this makes it unlikely that the encephalitis was causally linked to the measles virus component of the vaccine.

7.5 Arthropathies and other reactions:
Rubella infection or immunisation can be associated with arthropathy, especially in adults. This can be expected to begin approximately 14-21 days after immunisation. Only one report of arthritis was received with onset within this period. In all, there were 6 reports of arthritis. Analysis of the time of onset of the 47 reported cases of arthropathy (arthritis and arthralgia) after MR immunisation shows that the onset for most cases was outside the expected time, (see Figure 7) suggesting that many cases were unlikely to be causally associated with the rubella virus component of the vaccine.

![Number of cases by days after immunisation](image)

Figure 7. Time of onset of reported cases of arthropathy.

Other serious suspected reactions that have been reported include erythema multiforme (9), herpes zoster (7), Henoch Schonlein purpura (5) and thrombocytopenia (2).

8. Evaluation:
The impact of the campaign has been evaluated from coverage and surveillance data. The coverage data has been analysed by locality and has been disaggregated according to the age bands of the immunised children. Further correlations are being
from laboratory reporting, age specific sero-epidemiology, coverage data and vaccine efficacy data, as well as experience of other countries.

Despite the short period of time available between the decision to run the campaign and its implementation, an enormous amount of preparation was necessary against very tight deadlines. In the face of an impending epidemic, an intensive school based campaign was the only way of getting large numbers of children immunised sufficiently quickly. The campaign approach also offered the prospect of interruption of virus transmission.

There were some unexpected difficulties, such as the concern of some sections of the community about the origins of the cell line used to grow rubella vaccine viruses, but notwithstanding such problems, very high coverage was achieved in the allotted period of time.

On the basis of spontaneous reporting, only one in every 6,700 children immunised with MR vaccine in the UK were reported to have experienced any adverse reaction whatsoever. Spontaneous reporting systems are vulnerable to under-reporting, but favour reporting of acute and serious reactions. The reports of suspected adverse reactions do not necessarily imply a causal relationship. In some cases, the association of these reactions and MR vaccine will have been coincidental. Even allowing for previous immunity against measles in many children, the balance of risks and benefits associated with MR vaccine is extremely favourable compared with the incidence of serious sequelae after wild measles virus infection.

The impact of the campaign is already apparent. There has been no measles epidemic in 1995 and there are clear signs that measles transmission has been interrupted in much of the country. Measles notifications are at historic low levels and confirmed cases, especially indigenously acquired ones, are remarkably few. The UK now has measles surveillance of world leading class. The next steps will be to consolidate the gains achieved through the campaign.

A very large number of health professionals played their part. GPs clearly dealt with many enquiries from parents: a gratifying sign of the trust that parents have in their GPs as sources of such advice. The PHLS, Immunisation Co-ordinators, school health services, especially nurses, schools and pharmacists made an invaluable contribution to a most successful campaign.