JOINT COMMITTEE ON VACCINATION AND IMMUNISATION

Minute of the meeting held on Friday 13 April 2012
1 – 4.00 pm
Richmond House, Department of Health,
79 Whitehall, London, SW1A 2NS

Members
Professor Andrew Hall (Chair)
Dr Syed Ahmed
Dr Maggie Wearmouth
Professor Ray Borrow
Mr Chris Liffen
Dr Anthony Harnden

Professor Judy Breuer
Dr Jennifer Harries
Dr Gabrielle Laing
Mrs Pauline MacDonald
Mrs Anne McGowan
Dr Andrew Riordan
Professor Matt Keeling

Devolved administrations
Dr Nicola Steedman (Scottish Government)
Dr Elizabeth Reaney (DHSSNI)
Mr David Vardy (Welsh Assembly Government)
Dr Heather Payne (Welsh Assembly Government) – by phone
Mr Gareth Brown (Scottish Government)

Professor David Salisbury CB
Dr Dorian Kennedy
Dr Tom Barlow (minute)
Mr Andrew Earnshaw (minute)
Mr Guy Walker
Miss Kristin McCaugherty
Professor John Newton – for item 2
Sara Mason – for item 2

Invited observers and presenters
Dr Mary Ramsay (HPA)
Professor Stephen Inglis (NIBSC)
Dr Gayatri Amirthalingam (HPA)
Dr Richard Smithson (Public Health Agency, NI)
Lt Col Peter Hennessey (MoD)
Dr Darina O’Flanagan (Eire)
Professor John Watson (HPA)
Professor John Edmunds (LSHTM)
Dr Marc Baguelin (HPA)
Ms Michelle Lloyd (Solutions Research)
Ms Caroline Partridge (Solutions Research)
Dr Jim McMenamin (HPS)

DH

Professor John Newton

MHRA
Dr Phil Bryan
Dr Bridget King
I. Welcome
1. The chair welcomed all to the meeting and two new committee members: Dr Maggie Wearmouth, an academic community paediatrician and Mr Chris Liffen, a lay member. Dr Heather Payne was welcomed as a new observer from the Welsh Assembly Government. The committee were informed that Dr Richard Roberts would be attending future meetings as an observer on behalf of Public Health Wales. Apologies were received from Professors Jon Friedland, Claire-Anne Siegrist and Dr Peter Baxter. The Chair noted that Dr Dorian Kennedy will be taking up a new post in the Department of Health and thanked him on behalf of the committee for his excellent work in support of the committee and wished him well.

2. The chair explained that this additional meeting had been convened to continue considerations about potentially extending the influenza vaccination programme to low risk children. The meeting also allowed the committee to continue discussions about plans for the national immunisation programme following NHS restructuring in England.

3. The chair reminded attendees not to circulate papers marked confidential nor to discuss the information with others outside of the meeting.

II. Immunisation and PHE (paper JCVI 12/15)
4. The chair reminded members that following discussions at the February 2012 JCVI meeting, the committee had written to the Chief Medical Officer for England about the future delivery of the national immunisation programme. The CMO had responded by asking officials to liaise directly with JCVI on the issues raised. Dr Nick Hicks (DPH Milton Keynes), leading on provision of local advice on immunisation programme delivery, and Professor John Newton (RDPH NHS South Central), leading on data/evidence requirements and delivery and service quality assurance functions in PHE, had been invited to this JCVI meeting. The chair welcomed Professor Newton and explained that Dr Hicks could not attend; he would be invited to the next JCVI meeting. The committee had also received a working draft paper from DH on an emerging model for the national immunisation programme that had been developed in consultation with some members of JCVI and others from the NHS and HPA.

**Action:** Secretariat to invite Dr Hicks to next JCVI meeting.

5. Noting that accurate, timely immunisation coverage data is vital to evaluate the delivery of immunisation programmes and to respond to disease outbreaks, members asked how such data would be collected and aggregated, how geographical boundaries and responsible populations would be defined and how historic data would be held and accessed? It was explained that the NHS Commissioning Board (NHSCB) would be responsible for commissioning immunisation services in future; however no decision had been made about the level at which these services would be commissioned and therefore what level data would need to be aggregated. It is likely that data would need to be aggregated at multiple levels and using different geographical boundaries and populations. Data
may continue to be aggregated at PCT-level for a period of time following restructuring. It was suggested that it may be an opportune time to commission cohort management systems that could help support the effective management of public health interventions and disease outbreaks.

6. Members asked about the progress of the Child Health Information Systems (CHIS) specification that had been circulated to JCVI for comment in February 2012. It was explained that the specification was close to being finalised and discussions with CHIS suppliers would begin shortly. However, it was recognised that it may take some time for full and uniform implementation of the new specification given the variation in current systems and the varying duration of current contacts with CHIS suppliers. The first priority would therefore be safe transition.

7. Members noted that there remained a lack of clarity about the responsibilities for the local management of immunisation programmes and in particular the role of immunisation coordinators in the new system. This situation raises the risks that the management of immunisation services becomes fragmented and the present, experienced staff leave this area of work. It was explained that the need to define the roles and responsibilities of immunisation coordinators was well recognised and work was ongoing to define the role and working arrangements as a matter of urgency.

8. Members noted that it was difficult to divide health and public health services from one another and that clear governance routes were needed to assure smooth transition and the effective future engagement that is needed between all relevant organisations. There is a risk that where there is overlap between organisations, the overlapping services might not be adequately resourced or funded; for example, the provision of specialist paediatric advice that is needed for immunisation programmes may not be viewed by Local Authorities (LAs) nor by Clinical Commissioning Groups as within their remit. In addition, whilst PHE would provide public health advice to NHSCB and LAs, there was a clear challenge about supporting both organisations to identify when advice was needed and strong relationships would be needed. DH policy officials explained that as part of the process to develop the agreement for delivery of national immunisation programmes by the NHSCB (the section 7A agreement with DH), a detailed service specification for each programme was being developed. This will set out the evidence base for how a programme should be commissioned and delivered, including the provision of the type of services highlighted in the example above. The NHSCB was already developing models for how services would be commissioned. As part of developing the service specifications, JCVI will be invited to review and comment on them, with the first draft service specification potentially available for the next JCVI meeting. **Action:** JCVI to comment on draft service specifications at the June 2012 JCVI meeting.
9. The committee welcomed the working draft paper from DH on the emerging model for the national immunisation programme, noting that it provided more clarity about plans. Members agreed to provide comments by correspondence.

**Action:** members to provide comments to the secretariat on the emerging model by email.

III. Potential extension of the influenza vaccination programme to age groups of children (paper JCVI 12/16)

10. The chair reminded members that the committee had asked for information in a number of areas in order to continue considerations about expanding the influenza vaccination programme to cover specific age groups of children. This information had been gathered and provided in a number of papers. Members were reminded that the Secretary of State had asked JCVI to provide a recommendation on the influenza vaccination programme under the terms of the NHS Constitution.

Cost effectiveness of extensions to the influenza vaccination programme

11. The committee was presented with an overview of an unpublished study from the Health Protection Agency (HPA) and London School of Hygiene and Tropical Medicine (LSHTM) on the cost effectiveness of the influenza vaccination programme and a range of possible extensions to different age groups of the population\(^1\). The study followed the methodology and criteria of the National Institute of Health and Clinical Excellence to estimate the cost effectiveness of the current influenza vaccination programme compared with no vaccination and then the incremental cost effectiveness of a range of extensions. The study used the outputs of two other unpublished HPA-LSHTM studies: an analysis of the burden of influenza in terms of GP consultations, hospitalisations and deaths by influenza strain, age and risk group\(^2\) and a transmission dynamic model able to reconstruct past influenza epidemics from 1995/6 to 2008/9 to assess the impact of the current and other vaccination strategies\(^3\). These studies had been peer-reviewed in September 2011 by the JCVI influenza sub-committee supplemented by additional experts in mathematical modelling and health economics and considered by JCVI in October 2011. The cost effectiveness study had since been updated to take into account the comments made by the sub-committee and committee. The updated study had then been reviewed again by correspondence by members of the JCVI influenza sub-committee and additional experts, and the authors of the study had responded to the comments.

12. A committee member presented an overview of POLYMOD, a pan-european survey of human social contact patterns\(^4\). Data from this study had been used in the HPA-LSHTM study to model influenza transmission within the population. The survey is recognised as the best available source of data on human contact patterns and has

\(^1\) Baguelin *et al.* The cost effectiveness of vaccination against seasonal influenza in England. *Unpublished.*


\(^3\) Baguelin *et al.* Reconstructing past influenza epidemics from consultation, virological surveillance data and a contact survey. *Unpublished.*

been used widely in a large number of modelling studies. However, there are limitations to the data including: although only 1000 respondents were sampled from the UK, the sample size for any given one year age group is relatively small; the sampling of the respondents may introduce biases; information about contacts between people is not detailed; and average contact patterns are measured whereas the contact patterns of individuals with specific illnesses may be more applicable.

13. In considering the updated study, the comments from the JCVI influenza sub-committee and additional experts, the responses from the authors, and the overview of the POLYMOD survey, the committee:
   • Noted that the updated study addressed the comments made by the JCVI influenza sub-committee and additional experts and JCVI at their meetings in autumn 2011;
   • Noted that the authors had addressed the comments on the updated study made by the JCVI influenza sub-committee and additional experts and that these comments were of a relatively minor nature and did not affect the overall conclusions of the study.

14. In discussing the findings of the cost effectiveness study, the committee noted that:
   • Vaccine effectiveness assumptions had been based on a recent systematic review\(^5\) with adjustments to take into account the degree of matching of the available vaccine to the circulating strains over the influenza seasons considered and to take into account lower vaccine efficacy in older people. It had been assumed that influenza vaccines are equally effective in children and adults. This was a reasonable assumption to make when comparing the effectiveness of live attenuated or adjuvanted inactivated influenza vaccines in children with unadjuvanted influenza vaccines in adults but not when comparing the effectiveness of unadjuvanted influenza vaccines in children and younger adults. It had also been assumed that influenza vaccines are equally effective against infection and disease and in the absence of data this was also a reasonable assumption to make;
   • Vaccine associated adverse reactions had not been considered in the analysis, however this was reasonable given the safety profile of the live attenuated intranasal influenza vaccine (see later);
   • The findings are sensitive to the estimated numbers of influenza-related deaths. Whilst there is uncertainty in estimating influenza-related deaths, a range of estimates had been considered and the results of the model were based on the lower estimates, which may underestimate the number of deaths, particularly in older adults;
   • The cost effectiveness of influenza vaccination of children is dependent on the extent of protection provided. Vaccination of children (aged six months to less than 17 years or five to less than 17 years) is likely to be cost effective if considering only the age group targeted (including vaccinated and unvaccinated).

and is highly likely to be cost effective and well below the established cost effectiveness threshold when indirect protection to the whole population is taken into account, particularly when considered over the longer-term. Vaccination of children aged five to less than 17 years is the most cost effective option.

- As few children die from influenza and those that do often have clinical risk factors, the number of deaths of children that would be averted from additionally vaccinating healthy children would be relatively small. As most severe influenza disease and influenza-related deaths occur in older adults and those in clinical risk groups, most of the cases of severe disease and death that would be averted from vaccinating children would be of older adults and those in clinical risk groups. Most of the benefit to children from vaccinating healthy children arises from averting a large number of cases of less severe influenza disease.

- It would be cost effective to increase vaccine uptake in the clinical risk groups aged under 65 years to at least 75% (assuming no additional costs other than vaccine and vaccine administration costs). In addition, it remains cost effective to vaccinate children under circumstances where vaccine uptake is 75% in the clinical risk groups and those aged 65 years and older.

- The cost effectiveness of a programme of vaccinating children against influenza is not very sensitive to either vaccine costs or administration costs, although the start up costs of a programme had not been included as the analysis reflected the costs of an established programme.

15. The committee concluded that the cost effectiveness study had been well conducted, was based on appropriate and accepted methodology, included appropriate sensitivity analyses and had used reasonable assumptions. However, uncertainties remain about some parameters, for example, the level of indirect protection that would arise (discussed in the next section), level of vaccine uptake and implementation costs. The model provided a suitable and robust basis for informing policy, as long as the uncertainties in the results were recognised and acknowledged.

Contribution of children to influenza transmission and herd protection from influenza vaccination of children

16. The committee considered a summary of published studies on the contribution of children to influenza transmission and on the population protection from influenza vaccination of children and noted that:

- Studies were very variable in terms of the methodologies used, populations studied, sample sizes and quality;
- Community level studies of the impact of influenza vaccination of children on other age groups generally suggested protective effects, although one large study had failed to observe an effect;
- No epidemiological studies, except for one that had not found evidence of an indirect impact, had been conducted under circumstances akin to the UK situation of 75% vaccine uptake in people aged 65 years and older and 50% vaccine uptake in clinical risk groups aged less than 65 years.
17. Members considered that taken together the findings from the published studies lent support to the findings of the HPA-LSHTM study and the evidence suggested that some level of population protection should be expected. Members of the JCVI influenza sub-committee had made a similar observation. One JCVI member suggested that the quality of the evidence provided by the studies was insufficient to support this conclusion, suggesting that a larger population effect should have been evident in at least some of the studies.

Influenza vaccines for children
18. The committee considered additional information provided by the manufacturer (AstraZeneca) of the live attenuated intranasal influenza vaccine (Fluenz®), noting that the company had addressed the questions raised by the committee. The vaccine had long-established use in the United States and has a good safety profile. Furthermore, evidence suggested it was significantly more effective in children than the unadjuvanted inactivated influenza vaccines used currently. The vaccine was authorised for use in children aged two to less than 18 years and therefore would be suitable for use in a programme to vaccinate school children. However, the identified contraindications and precautions would need to be managed in the design of any programme.

19. The committee noted that, whilst the vaccine had a European market authorisation, the potency/strain change assay for this vaccine had yet to be endorsed by the European Medicines Agency (EMA). However, EMA would be considering this shortly.

20. The committee noted that the application for market authorisation for an adjuvanted inactivated influenza vaccine (Fluad paediatric®) had been withdrawn by the manufacturer (Novartis).

21. Given the superior effectiveness, good safety profile and lack of an alternative equivalently effective influenza vaccine for children, the committee concluded that Fluenz® should be the vaccine of choice for an influenza vaccination programme extended to healthy children.

22. The committee noted that the manufacturer had capacity to supply appreciable quantities of vaccine given long (> one year) lead in times. Central procurement of influenza vaccine to support an annual influenza vaccination programme for children would be the most practicable approach to securing the quantities that would be required. However, it would take some time to set up and agree contracts for the supply, storage and distribution of the very large quantities of vaccine that would be needed.

Attitudinal research on influenza vaccination of children
23. Researchers from Solutions Research presented an overview of a qualitative attitudinal research study undertaken to explore the views of parents, children, head
teachers and nurses on the prospect of influenza vaccine being offered annually to pre-school-aged, and school-aged children. Around 130 people had taken part in the study and the parents interviewed were of children of all ages and were of a mixture of social grades. The findings suggested that:

- Attitudes to the current childhood immunisation programme were overwhelmingly positive;
- Influenza was generally poorly understood, was not of great concern nor considered a serious illness in children, particularly when there had been no direct experience of severe influenza and, against this background, the need and rationale for a programme of vaccinating children against influenza was questioned;
- Responses to the programme were mixed but could be assigned to one of three general types: active acceptance, passive acceptance and active rejection;
- Triggers for acceptance included: better understanding of the severity of influenza, the indirect protection against influenza that the vaccination could provide to others particularly in the family, the inclusion of programme within schools, and the less invasive administration of a vaccine via nasal spray (although there were uncertainties around the ease of administering the nasal spray to pre-school and the youngest school-age children);
- Triggers for rejection included: the perceived need and cost of the vaccination programme, concerns about the side-effects and effectiveness of the vaccine, and annual vaccination adversely affecting the development of natural defences against influenza. When presented with the notion that a primary benefit of an influenza vaccination programme for children could be the indirect protection of vulnerable adults (older adults and those in clinical risk groups), this acted as a trigger for rejection as it was known that people in these groups are offered and should accept the vaccination for themselves;
- Should a vaccination programme be introduced, a education/information campaign would be needed to inform parents, children and others about the reasons for the introduction of the programme, the benefits of the programme and the short and long-term safety and effectiveness of the vaccine;
- Head teachers and nurses had few concerns as long as logistic arrangements for a schools-based programme were well planned, communicated and executed.

24. The committee noted that the study had recruited subjects through a Marketing Agency and the population surveyed may therefore not be representative of the English population.

**Resource implications of extending influenza vaccination to children**

25. The committee was presented with an analysis from the DH Health Protection Analytical Team on the resource implications of an influenza vaccination programme for school-aged children. A comparison had been made with the resources needed for current school based programmes for HPV and Td/IPV vaccinations. The committee noted that:
• A 30% uptake of influenza vaccination by school children would increase seven-fold the total number of all vaccinations given, in the peak month, to school children. Higher uptakes would lead to proportionately greater numbers of vaccinations;
• There are far too few school nurses working in the NHS to deliver a programme of this size (e.g. to deliver a vaccine uptake of 30% would require nearly one and half times the number of school nurses currently to be working continuously all and each working day only administering vaccine during the peak month; higher vaccine uptakes would require proportionately more school nurses);
• The estimated unit costs of administering vaccinations in schools was not appreciably different from cost estimates of vaccinations administered through GP practices.

26. It was noted that the MR vaccine catch-up campaign had involved the delivery of a similarly large number of vaccinations to children within a short period of time. However, this had been a single one-off programme, not the annual vaccination required for an influenza vaccination programme.

27. The committee asked whether other suitably qualified or non-qualified but adequately trained staff might be recruited to support school nurses to deliver a programme of influenza vaccination in schools.
    **Action:** DH to investigate the possibility of alternative persons to administer influenza vaccine.

Discussion
28. In discussion about the evidence presented, the committee concluded that:
• Whilst very costly, there is clear evidence from the cost effectiveness study that the influenza vaccination of children is likely to be a cost effective public health intervention that could, given sufficiently high uptake of influenza vaccine by children and assumptions about indirect protection, appreciably lower the public health impact of influenza in the UK;
• Given the superior effectiveness, good safety profile and lack of alternative equivalently effective influenza vaccine for children, Fluenz® should be the vaccine of choice for an influenza vaccination programme for children used within its market authorisation;
• Given that vaccinating children aged five to less than 17 years is the most cost effective option, that children under two years cannot receive the vaccine of choice, and that attitudinal research had suggested that vaccination of pre-school children is likely to be less well accepted by parents than the vaccination of school children, an extension to the influenza vaccination programme could initially target school-aged children spanning age five to less than 17 years;
• There is clear evidence from the implementation of other immunisation programmes (e.g. HPV vaccination), and from attitudinal research, that offering influenza vaccination through schools may be the most effective route to deliver a vaccination programme for school-aged children;
• There are far too few school nurses currently to allow the implementation of an annual programme in schools. The provision of school nurse services would need to be expanded several-fold to support a programme, and/or alternative arrangements would need to be made, such that other appropriate persons could be involved in the delivery of a programme;

• Current changes to the education system with increasing numbers of schools becoming academies, and therefore outside of local authority control, may present additional challenges to the implementation of schools-based immunisation programmes as it would be for academies to decide on an individual basis whether to accept or reject delivery of immunisation programmes in school. Discussions with the Department of Education would be required to develop an implementation strategy.

• The annual influenza vaccination of children as routine would be a huge expansion of the childhood immunisation programme as a whole. It would be important to mitigate the potential opportunity costs. It would be vital that the introduction of a programme did not adversely affect current immunisation programmes in terms of finance, staff resources and public perceptions. Resources should not be removed from the current national immunisation programme or from local immunisation-related resources to implement and deliver an expanded influenza vaccination programme. Furthermore, it would be inadvisable to introduce this very large immunisation programme into the NHS until the large scale restructuring of the health and public health system in England had been completed and the new system was running smoothly;

• Attitudinal research suggested that public attitudes to an influenza vaccination programme for children may vary widely and that the programme would be received with very mixed opinions by parents. Although not an area investigated in depth in the research, it is possible that reactions to the extension to the programme may also be mixed among health professionals. A campaign to inform and educate parents and children and also health professionals about influenza, the live attenuated intranasal vaccine and the benefits of the expanded programme to children and others would be needed in advance of, and alongside, a vaccination programme in order for the programme to be implemented successfully.

• There may be additional benefits from such a programme: increasing opportunities for general health promotion in schools, strengthening school health services and wider understanding of immunisation and of the dangers of influenza by children and parents.

29. In light of these conclusions, members considered that an extension of the annual influenza vaccination programme should include school-aged children (e.g. reception to school year 12 in England) using, within its market authorisation, the live attenuated intranasal vaccine (Fluenz®) as the vaccine of choice but with arrangements made for children that cannot receive this vaccine. Such an extension to the programme would be best delivered in schools. Some members had concerns about extending the programme including: uncertainty about the extent of indirect protection arising from an extended programme; the potential
mixed reactions to the extension from the public and health professionals; and the impact of the mobilisation of the very large resources required to implement the extension with the potential for large opportunity costs to the national immunisation programme and possibly other health programmes. If an extended programme were to be recommended, it should not be implemented until autumn 2014 at the very earliest given the need for an extensive information/education campaign, a strategy to implement and adequately resource a schools-based programme and arrangements for the procurement of the large scale supply, storage and distribution of vaccine and also to allow the impending changes to the health and public health system in England to be completed and for the new system to be running smoothly. The committee would consider its recommendations further and produce a statement.

**Action:** committee to produce a statement and recommendations.

30. Members noted evidence on the effectiveness of a single dose of live attenuated intranasal influenza vaccine in children that have not received influenza vaccine previously. It was suggested that, given the additional resources and increased complexity of implementation to provide two doses of vaccine to children that had not received influenza vaccine previously, the committee should consider whether to advise that one dose be given, at least for children not in clinical risk groups, if introducing the expanded programme. In addition, members suggested that consideration should be given to the preferential use of the live attenuated intranasal influenza vaccine in the current programme for children in most, clinical risk groups (except severe asthma and some with immunosuppression).

**Action:** committee to consider a single dose of the live attenuated vaccine for children that had not received influenza vaccine previously and the preferential use of this vaccine in children in most clinical risk groups at the next meeting.

**IV. Any other business**

31. There was no other business. The chair thanked all those that presented information to the committee and all those in attendance.

The JCVI agenda and meeting papers are published on the meetings area of the JCVI website [http://www.dh.gov.uk/ab/jcvi/index.htm](http://www.dh.gov.uk/ab/jcvi/index.htm)
Annex 1 - Declarations of interest

**Agenda Item III**  
The following members declared interests in companies that manufacture and supply influenza vaccines (Abbott, AstraZeneca, Baxter, Crucell, GSK, MASTA, Novartis, Pfizer, Sanofi-Pasteur MSD)

<table>
<thead>
<tr>
<th>Member</th>
<th>Action Description</th>
<th>Interest Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ray Borrow</td>
<td>Non-personal, non-specific GSK, Baxter, Novartis, Pfizer and Sanofi-Pasteur MSD</td>
<td>The member is able to participate in the discussion and to vote</td>
</tr>
<tr>
<td>Judith Breuer</td>
<td>Non-personal, non-specific Sanofi-Pasteur MSD</td>
<td>The member is able to participate in the discussion and vote</td>
</tr>
<tr>
<td>Anthony Harden</td>
<td>Personal, non-specific AstraZeneca</td>
<td>The member is able to participate in the discussion but not to vote</td>
</tr>
<tr>
<td>Pauline MacDonald</td>
<td>Personal, non-specific GSK</td>
<td>The member is able to participate in the discussion but not to vote</td>
</tr>
<tr>
<td>Anne McGowan</td>
<td>Non-personal, non-specific GSK and Sanofi-Pasteur MSD</td>
<td>The member is able to participate in the discussion and to vote</td>
</tr>
<tr>
<td>Andrew Riordan</td>
<td>Non-personal, non-specific GSK</td>
<td>The member is able to participate in the discussion and to vote</td>
</tr>
</tbody>
</table>

Professor John Edmunds (LSHTM), an author of the cost effectiveness study, also declared a personal, non-specific interest in GSK. He presented the study and discussed the findings.
Annex 2 - Evidence considered by the committee.

**Agenda item 2:**
- Paper: An emerging model for the national immunisation programme from April 2013
- DH press release: Duncan Selbie confirmed as Chief Executive Designate of Public Health England

**Agenda item 3**
- Overarching paper: Consideration of the possible extension of the influenza vaccination programme to children
- Discussion papers:
  - Impact and cost effectiveness of possible extensions to the seasonal influenza vaccination programme
  - Contribution of children to influenza transmission and herd protection from influenza vaccination of children
  - Influenza vaccines for children
  - Attitudinal research on influenza vaccination of children
  - Resource implications of extending influenza vaccination to children
- Authors response to reviewers comments on the study of the cost effectiveness of possible extensions to the seasonal influenza vaccination programme